

## A REVISION OF PSYCHOTRIA (RUBIACEAE) IN SAMOA

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The family Rubiaceae is one of the largest of all angiosperm families and is particularly abundant in the tropics. In Polynesia it comprises 24 genera (Darwin, 1979) and in species numbers is probably the largest dicotyledonous family. *Psychotria* L. is the largest of the Pacific genera of Rubiaceae and is perhaps second only to *Cyrtandra* J. R. & G. Forster of the Gesneriaceae in the number of native species in the region. *Psychotria* has fruits and seeds that are readily spread by frugivorous birds and is prone to speciation when dispersed to new areas. It is found on all the major high islands of Polynesia, with about 80 species in Fiji (Darwin, 1979), 11 in Hawaii (Sohmer, 1977), nine in the Marquesas (Fosberg, 1939), and more than eight in the Society and Tubuai Islands (Fosberg, 1937). Most Pacific species of *Psychotria* are restricted to a single island or archipelago but are closely related to those of neighboring ones.

### TAXONOMIC HISTORY OF THE GENUS IN SAMOA

Twenty-four species of *Psychotria* have been described from or attributed to Samoa since the first records of the Samoan Rubiaceae were published by Gray in 1860, and two other species originally described in different genera actually belong to *Psychotria*. However, since no comprehensive study of the genus in Samoa has been done and no keys have been published, the genus has long been in need of revision.

The first specimens of *Psychotria* recorded from Samoa were collected by the United States Exploring Expedition in 1839. Unfortunately, these collections were very poorly prepared—no collection numbers or localities were recorded. Twenty-one years later, Gray (1860) described five species (one of them in a different genus) based on those collections, but another 38 years passed before any more were published. During this long interval, however, several collectors were at work, most notably Graeffe (ca. 1862), Powell (ca. 1860–1870), and Whitmee (ca. 1875), but their specimens, including eight representing species new to science, were ignored until the end of the century.

The next treatment of the genus in Samoa was done by Schumann in Reinecke's *Die Flora der Samoa-Inseln* (1898). Based upon the collections of Reinecke and Graeffe, Schumann named eight new species in the genus (one, however, turned out to be conspecific with one described by Gray). Reinecke

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worked in Samoa from 1893 to 1895 and collected 13 of the 20 species that are recognized in the present paper.

After a brief hiatus, botanical work in Samoa intensified, reaching its high point in 1905, when four botanists were collecting in the archipelago. The most prolific of the four was Rechinger, who collected nearly 2000 specimens in a single four-month period, including about 15 species of *Psychotria*. From these Rechinger (1908, 1909) named four new species; three of the names, however, have now been reduced to synonymy. For some reason the fourth, still valid species was omitted when Rechinger published his collection data (1910).

Of nearly equal importance are the specimens of Vaupel, who collected in Samoa from 1904 to 1906. His gatherings included 11 species of *Psychotria*, two of which had not previously been collected. One of these was named by Lauterbach (1908) but was incorrectly placed in the genus *Randia*; the other has not been described until now. The remaining two botanists collecting in Samoa in 1905, Hochreutiner and Lloyd, did not collect any new *Psychotria* species. Their collections are of minor importance, although Hochreutiner (1934) did describe three minor varieties (which are not recognized in the present paper).

The most complete work on the genus in Samoa, and the last until the present paper, was prepared by Christophersen based upon the large collection he amassed during field work in 1929 and 1931. Christophersen collected 17 of the 20 species recognized here, two of them new to science. In his publication (1938) he named four new species, but two of the names are herein reduced to synonymy.

During field work in Samoa between 1971 and the present, I have collected over 4500 specimens, including 18 of the 20 *Psychotria* species, but none of the 18 is new. Collections by Bristol in 1968 and Cox over the last several years have likewise failed to include any new species. It thus appears that the available specimens (over 480 collection numbers) represent a fairly complete sampling of the genus, and very few new species can be expected to turn up in the future. Although the collections appear to be adequate, the study of the genus certainly is not—I have found it necessary to describe four new species and make two new combinations from the available material.

During my study of the genus, which began in 1973, I visited a number of European and American institutions to examine their collections and select specimens that were subsequently to be received on loan. Effort was made to examine and record every specimen collected in the archipelago. Specimens at the following institutions were utilized: Harvard University Herbaria (A and GH), Botanisches Museum of Berlin-Dahlem (B), Bernice P. Bishop Museum (BISH), British Museum (Natural History) (BM), Royal Botanic Garden, Edinburgh (E), Conservatoire Botanique, Geneva (G), Hamburg Institut für Allgemeine Botanik (HBG), Royal Botanic Gardens, Kew (K), Botanische Staatssammlung, Munich (M), National Herbarium of Victoria (MEL), my personal collection at the Pacific Tropical Botanical Garden (PTBG), University of California, Berkeley (UC), U. S. National Herbarium (US), Botanical Institute, Wroclaw (WRSL), and Naturhistorisches Museum, Vienna (W).



**Psychotria** L. Syst. Nat. ed. 10. 929, 1364. 1759, nom. cons.

Shrubs to small or occasionally medium-sized trees. Stipules interpetiolar, often connate and sometimes forming campanulate sheath, caducous. Leaves opposite or rarely appearing whorled at ends of branches, usually glabrous. Inflorescences generally terminal but occasionally in upper axils, usually paniculate and many flowered, sometimes trichotomous from base. Calyx synsepalous, lobed to subentire, 4- or 5-merous; corolla sympetalous, usually with narrow tube and 4- or 5-lobed, spreading or recurved limb, white to greenish, often pubescent within; stamens 4 or 5, epipetalous, subsessile or with short filaments, exerted or included; ovary inferior, 2-locular, each with single basal ovule. Fruits with or without persistent calyx, fleshy, red, pink, or purple at maturity, each containing 2 thick-walled, usually longitudinally ribbed pyrenes.

The genus in Samoa consists of 20 species, of which seventeen are endemic and one has two subspecies. The three nonendemic species are *Psychotria insularum* A. Gray (found in Tonga, Wallis and Futuna, and Niue), *P. forsteriana* A. Gray (Tonga, Fiji, and probably westward into Melanesia), and *P. carnea* (Forster f.) A. C. Smith (Tonga and Fiji). The distribution of the species in Samoa is shown in the TABLE. Savaii, the largest island in the archipelago, has 17 of the species, Upolu has 14, and Tutuila and the three islands of Manua have only three species among them.

Only one section of the genus, sect. *Eumachia* (DC.) A. C. Smith, has been described from the area (Fiji) (Smith, 1936), and its type species, *Psychotria carnea*, is also found in Samoa. At least four other Samoan species, *P. chlorocalyx* Schumann, *P. geminodens* Reinecke, *P. savaiiensis* Rech., and *P. vaupeлии* Whistler, fit into this section, which is characterized by four-merous flowers with the corolla lobes developing edge to edge so as to give the corolla a four-angled, distally enlarged appearance before anthesis. Additionally, *P. sclerocarpa* Whistler may belong here, but the available specimens all lack flowers.

A second group includes only two species, *Psychotria forsteriana* and *P. samoana*. These differ from all other Samoan species of *Psychotria* in having two-lobed fruits with pyrenes entirely unribbed. Additionally, the flowers of these two species are the smallest of any *Psychotria* in Samoa.

A third group includes *Psychotria apodantha* A. Gray, *P. christophersenii* Whistler, *P. garberiana* Christoph., *P. insularum* A. Gray, *P. pacifica* Schumann, *P. reineckei* Schumann, and *P. xanthochlora* Schumann. These are characterized by five-merous flowers usually villous within, prominently ribbed pyrenes, and leaves that often dry mottled reddish brown and gray. Also questionably included in this group are *P. gigantopus* Schumann and *P. clostercarpa* A. Gray.

The remaining three species, *Psychotria bristolii* Whistler, *P. grandistipulata* (Lauterb.) Whistler, and *P. juddii* Christoph., do not appear to be closely related either to each other or to the three above-mentioned groups.

I hesitate to label these groups, except for the previously described sect. *Eumachia*, as sections. In his ongoing *Flora Vitiensis Nova*, A. C. Smith will soon be publishing a treatment of the approximately 80 Fijian species of *Psy-*



Distribution of Samoan taxa of Psychotria.

TAXON	ISLAND				
	Savaii	Upolu	Tutuila	Manua	Other
<i>P. apodantha</i>	x	x			
<i>P. bristolii</i>	x				
<i>P. carnea</i> subsp. <i>carnea</i>	x				x
subsp. <i>oncocarpa</i>		x			
<i>P. chlorocalyx</i>		x			
<i>P. christophersenii</i>	x				
<i>P. closterocarpa</i>	x	x			
<i>P. forsteriana</i>	x	x	x		x
<i>P. garberiana</i>				x	
<i>P. geminodens</i>		x			
<i>P. gigantopus</i>	x	x			
<i>P. grandistipulata</i>	x	x			
<i>P. insularum</i>	x	x	x	x	x
<i>P. juddii</i>	x				
<i>P. pacifica</i>	x	x			
<i>P. reineckei</i>	x	x			
<i>P. samoana</i>	x	x			
<i>P. savaiiensis</i>	x	x			
<i>P. sclerocarpa</i>	x				
<i>P. vaupelii</i>	x				
<i>P. xanthochlora</i>	x	x			
Total taxa      21	17	14	2	2	3

chotria. Since most Samoan species of the genus are undoubtedly related to the Fijian ones, it does not seem wise to assign the Samoan species to sections until the species from the two areas have been compared.

Unlike the situation described by Sohmer (1977) in Hawaii, where all the present species of *Psychotria* evolved from two or three founding species, the Samoan taxa probably owe their origin to several arrivals. Thus it is nearly impossible to discuss phylogeny of the Samoan species without studying the genus over its entire region.

Since the Samoan species undoubtedly have a multiple origin with little sign of local speciation, it is not surprising that, although there are far more *Psychotria* species in Samoa than anywhere else in Polynesia, they do not constitute a “taxonomist’s nightmare” as they do elsewhere (Sohmer, 1977, p. 103). With the exception of *P. insularum* and *P. pacifica*, the genus has caused taxonomists very little trouble—only six of the twenty species, in fact, have synonyms. Most of the fertile specimens I examined were easily identifiable to species. Two of them, however, appear to be hybrids; these are discussed under *P. vaupelii*. Two other specimens appear to belong to an undescribed species, but since the material is inadequate, they are merely mentioned at the end of this treatment under “Undetermined Species.” It thus appears that the need for revising the genus was not due to its difficulty but to sheer neglect.



CHARACTERS USEFUL IN DISTINGUISHING AMONG  
SAMOAN SPECIES OF PSYCHOTRIA

**STIPULES.** The stipules are extremely variable in size and shape, ranging from small, linear-lanceolate ones in *Psychotria insularum* to large, persistent, campanulate stipule sheaths in *P. grandistipulata*. Sometimes even sterile specimens of apparently closely related species such as *P. insularum* and *P. xanthochlora*, and *P. christophersenii* and *P. garberiana*, can be distinguished by the stipules alone.

**LEAVES.** Some closely related species have similarly shaped leaves that differ in petiole length. In other species, such as *Psychotria forsteriana* and *P. samoana*, the leaves are similarly shaped but differ in width.

**INFLORESCENCES.** The inflorescences vary in size, degree of branching, and (in at least one case) position of origin. The closely related *Psychotria apodantha* and *P. pacifica*, for example, are most easily distinguished by such criteria: the former species has a single sessile umbel, the latter a panicle of umbels.

**FLOWERS.** The most obvious difference in the flowers is the number of parts, and sect. *Eumachia* can be separated from the rest of the Samoan species on the basis of its four- (rather than five-)merous flowers. The degree of lobing of the calyx is important in identifying one species, and the sizes of both the corolla and the calyx are significant in distinguishing many others. Several species have greenish rather than the normal white corollas, and one species even has a white calyx.

**FRUITS.** The most important differences are in size and shape. Also significant are the presence or absence of a persistent calyx, and the presence and degree of ribbing of the pyrenes. Two species, *Psychotria forsteriana* and *P. samoana*, completely lack ribbing. Red is the normal color of the mature fruit, but three species have pink to flesh-colored fruits, and another often has purple ones.

KEY TO THE SPECIES OF PSYCHOTRIA IN SAMOA

1. Fruits 2-lobed, not longitudinally ribbed when dry; flowers 2.5–6 mm long.
  2. Leaves usually 1–3 cm wide; inflorescences 1–2.5 cm long, 10- to 20-flowered. .... 1. *P. samoana*.
  2. Leaves usually 3.5–7 cm wide; inflorescences 2–6 cm long, 20- to 100-flowered. .... 2. *P. forsteriana*.
1. Fruits not 2-lobed, commonly longitudinally ribbed when dry; flowers more than 6 mm long.
  3. Flowers 4-merous, the corolla 4-lobed, lobes reflexed after anthesis.
    4. Calyx distinctly 2-lobed. .... 3. *P. geminodens*.
    4. Calyx 4-lobed to subentire.
      5. Fruits 16–30 mm long; corolla usually white; inflorescences 2–4 cm long.
        6. Leaves subsessile, petiole less than 1 cm long; fruits longitudinally ribbed when dry. .... 4. *P. savaiiensis*.
        6. Leaves with petiole 2–4 cm long; fruits not longitudinally ribbed when dry. .... 5. *P. sclerocarpa*.
      5. Fruits 10–16 mm long; corolla usually greenish; inflorescences 3–15 cm long.



- 7. Calyx cleft more than halfway; leaves 1.5–5.5 cm wide.
  - 8. Leaves 2–4 times as long as wide; Upolu. . . . . 6. *P. chlorocalyx*.
  - 8. Leaves 4–7 times as long as wide; Savaii. . . . . 7. *P. vaupelii*.
- 7. Calyx shallowly cleft; leaves 4–13 cm wide.
  - 9. Leaves with blade obovate, 12–22 by 7–13 cm; fruits with calyx 5–7 mm wide; Savaii. . . . . 8a. *P. carnea* subsp. *carnea*.
  - 9. Leaves with blade elliptic, 4–16 by 4–8 cm; fruits with calyx 3–5 mm wide; Upolu. . . . . 8b. *P. carnea* subsp. *oncocarpa*.
- 3. Flowers usually 5-merous, corolla never lobed.
  - 10. Inflorescences 10–40 cm long; leaves 14–45 cm long; fruits usually 15–35 mm long.
    - 11. Leaves appearing whorled at branch ends, petiole less than 2 cm long. . . . . 12. *P. gigantopus*.
    - 11. Leaves clearly opposite, petiole 4–9 cm long.
      - 12. Flowers 30–55 mm long; fruits 20–33 mm long, with single prominent rib on each pyrene face. . . . . 9. *P. bristolii*.
      - 12. Flowers 25–30 mm long; fruits 15–20 mm long, with several longitudinal ribs on each pyrene face. . . . . 13. *P. closterocarpa*.
  - 10. Inflorescences 1–10 cm long; leaves usually less than 15 cm long; fruits usually less than 16 mm long.
    - 13. Fruits 25–45 mm long; leaves not usually drying mottled.
      - 14. Flowers sessile, in many-flowered, globose heads. . . 11. *P. juddii*.
      - 14. Flowers on pedicels 3–20 mm long, in 10- to 20-flowered panicles. . . . . 10. *P. grandistipulata*.
    - 13. Fruits 7–20 mm long; leaves often drying mottled.
      - 15. Flowers subsessile; young stems often covered with erect, reddish brown hairs.
        - 16. Inflorescences panicles of umbels; leaves 20–60(–90) mm wide. . . . . 14. *P. pacifica*.
        - 16. Inflorescences single, sessile umbels; leaves 8–30 mm wide. . . . . 15. *P. apodantha*.
    - 15. Flowers pedicellate; young stems only rarely covered with erect, reddish brown hairs.
      - 17. Calyx 5–9 mm long, white, lobes oblong. . . 16. *P. reineckeii*.
      - 17. Calyx less than 5 mm long, green, shallowly lobed.
        - 18. Flowers 20–50 mm long; fruits 13–20 mm long, with cup-shaped calyx 2–3 mm long.
          - 19. Stipules 8–16 mm long, notched at apex; fruits ovoid to subglobose; flowers up to 27 mm long; Manua. . . . . 17. *P. garberiana*.
          - 19. Stipules 15–25 mm long, unnotched; fruits ovoid and often curved; flowers over 28 mm long; Savaii. . . . . 18. *P. christophersenii*.
        - 18. Flowers 6–26 mm long; fruits 7–13 mm long, with minute calyx.
          - 20. Stipules ovate to elliptic; flowers 10–20 mm long. . . . . 19. *P. xanthochlora*.
          - 20. Stipules linear-lanceolate; flowers 6–12 mm long. . . . . 20. *P. insularum*.
- 1. ***Psychotria samoana*** Schumann, Bot. Jahrb. Syst. **25**: 685. 1898; Rech. Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. **85**: 199. 1910; Christoph. Bernice P. Bishop Mus. Bull. **154**: 58. 1938. Var. *typica*



Hochr. *Candollea* 5: 268. 1934. TYPE: Samoa, Savaii, Aopo, *Reinecke* 418 (lectotype, here designated, BISH!; isolectotype, G!).

*Psychotria samoana* var. *microphylla* Rech. Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. 85: 199. 1910. TYPE: Samoa, Upolu, near Tiavi, 1905, *Rechinger* 5270 (holotype, w).

Shrub or small tree 1–3 m tall. Stems glabrous; stipules linear or lanceolate with long-attenuate tip, connate at base, 7–15 mm long. Leaves with petiole 3–16 mm long, glabrous; blade lanceolate to narrowly elliptic, 5–12 cm by 9–30 mm, the apex attenuate, the base acute, the surfaces glabrous, glossy green when fresh. Inflorescences terminal, few-branched panicles 1–2.5 cm long, bearing 10 to 20 flowers. Flowers with pedicel 0.5–2 mm long; calyx shallowly cup shaped, 1–2 mm long, entire or divided into 5 shallow, rounded lobes; corolla campanulate, 2.5–4.5 mm long, divided about halfway into 5 ovate lobes, white, glabrous outside, densely pubescent within; stamens 5, anther oblong, ca. 1 mm long, subsessile; style ca. 2–3 mm long, bifid ca. halfway into stigma lobes. Fruits obovoid to subglobose, 6–10 mm long, red at maturity, shallowly 2-lobed when dry.

TYPIIFICATION. *Reinecke* 304 and 418 were cited by Schumann in his description of the species. Christophersen noted the presence of 304 at B, but this and 418, which was probably also there, were presumably destroyed during World War II. However, duplicates of *Reinecke* 418 are at BISH and G, and those of 304 are at G, E, and US. I have chosen *Reinecke* 418 (BISH) as the lectotype. *Rechinger's* var. *microphylla* is based on his 5270, but I do not consider this specimen sufficiently different from the species to rank as a variety.

DISTRIBUTION. Endemic to Savaii and Upolu; understory tree in coastal to montane forest; near sea level to 1000 m alt.

ADDITIONAL SPECIMENS EXAMINED. **Samoa.** SAVAII: above Aopo, *Bristol* 2128 (BISH, GH, K); above Gataivai, *Bristol* 2288 (BISH, GH); above Salailua, *Bryan* 175 (BISH, GH); Salailua-Lataitai, *Christophersen* 2871 (BISH); Siuvao-Auala, *Christophersen* 3377 (BISH); *sine loco*, *Graeffe* 145 (HBG), 206a (HBG); near Aopo, *Rechinger* 1942 (w); Ologogo, *Vaupel* 639 (B, BISH, M, PTBG); E of Falealupo, *Whistler* 1025 (PTBG, US); above Aopo, *Whistler* 1707 (B, BISH, K, PTBG, US); above Asau, *Whistler* 1768 (B, BISH, BM, K, PTBG, US). UPOLU: Malololelei-Lanotoo, *Christophersen* 44 (A, BISH, K, US); *sine loco*, *Funk* s.n. (BM); *sine loco*, *Graeffe* 201 (HBG); Lanotoo, *Hochreutiner* 3272 (G); Tiavi, *Rechinger* 456 (w), 5270 (w); Lanotoo, *Rechinger* 1841 (BM, w); "Kammgebiet," *Reinecke* 304 (E, G, US); Mt. Fiamoe, *Whistler* 1166 (PTBG, US); Lanoataata, *Whistler* 1489 (PTBG); Lepue, *Whistler* 4183 (BISH, PTBG). WITHOUT FURTHER LOCALITY: *Horne* 43 (GH, K), *Powell* 180 (K), *U. S. Expl. Exped. s.n.* (GH, US 77357, US 653893), *Whitmee* 145 (K).

*Psychotria samoana* is closely related to the more widely distributed *P. forsteriana* but differs in having narrower, often attenuate-tipped leaves and fewer-flowered inflorescences. It appears to be more closely related to *P. amoena* A. C. Smith, a Fijian endemic. The label on *U. S. Expl. Exped. s.n.* (US 653893) indicates the locality as New Zealand, but this is almost certainly another example of the problems encountered when dealing with the improperly handled specimens from this expedition.



2. *Psychotria forsteriana* A. Gray, Proc. Amer. Acad. Arts **4**: 44. 1860; Schumann, Bot. Jahrb. Syst. **25**: 688. 1898; Rech. Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. **85**: 202. 1910; Hochr. Candollea **5**: 268. 1934; Christoph. Bernice P. Bishop Mus. Bull. **154**: 51. 1938. TYPE: Samoa, without further locality, U. S. Expl. Exped. s.n. (lectotype, here designated, US 62339!; isotype, GH!).

Small tree 1.5–4 m tall. Stems glabrous; stipules lanceolate, connate on lower portion, up to 20 mm long. Leaves with petiole 0.8–5 cm long, glabrous; blade elliptic, 6–22 by 3.5–7 cm, apex acute to acuminate, base acute, surfaces glabrous. Inflorescences panicles 2–6 cm long, often branching near base, bearing 20 to 100 or more flowers. Flowers with pedicel up to 1.5 mm long, glabrous; calyx shallowly cup shaped to campanulate, 0.5–1.5 mm long, shallowly 5-lobed; corolla campanulate, 4–6 mm long, divided about  $\frac{1}{3}$  of its length into 5 spreading, ovate lobes, white, densely pilose in band below sinuses; stamens 5, epipetalous in band of hairs, nearly exserted at corolla sinuses, the anther oblong, ca. 1 mm long, the filament of similar length; style ca. 2.5–4 mm long, stigma lobes 0.5–1 mm long. Fruits subglobose to obovate, 6–12 mm long, red at maturity, 2-lobed when dry.

TYPE. *Psychotria forsteriana* was described based on specimens collected by the U. S. Exploring Expedition and was attributed by Gray to Tahiti, Samoa, and Fiji (with var. *vitiensis* A. Gray from the latter archipelago). Gray also added a questionable synonym of “*Psychotria asiatica* Forst. Prodr. p. 16? non L.,” which would be a later homonym if it is the same species as *P. forsteriana*. It is not known why Gray added this synonym, and Forster’s description of *P. asiatica*, “stipulus emarginatus, foliis lanceolato-ovatis,” gives no clue as to why Gray would hesitantly equate the two species. Although there is a U. S. Exploring Expedition specimen of *P. forsteriana* at GH labeled as being from Tahiti, the species has never been collected there again, and it is likely that the specimen is mislabeled, an occurrence not unique among the Expedition’s collections, as was noted under the above species. Two other specimens of the Expedition exist, an unnumbered sheet at GH and US 62339. I have chosen the US specimen as the lectotype, and the GH specimen as the isotype.<sup>2</sup>

DISTRIBUTION. Indigenous to Savaii, Upolu, and Tutuila; understory tree in coastal to montane forest; near sea level to 1000 m alt. It also occurs in Fiji (var. *vitiensis* A. Gray), and in Tonga on Eua (G. Buelow, pers. comm.), but the record from Tahiti is doubtful.

ADDITIONAL SPECIMENS EXAMINED. **Samoa**. SAVAII: above Patamea, *Bristol* 2328 (GH), 2329 (BISH); above Salailua, *Bryan* 180 (BISH, GH, K); near Vaipouli, *Christophersen* 1842

<sup>2</sup>In most taxonomic literature lectotypes have been designated from United States Exploring Expedition specimens at US. Gray returned the first set to US and kept a nearly complete, but partially fragmentary, set at GH. Although some species are better represented at GH, this is not the case with Samoan species of *Psychotria*. I have therefore followed the convention of designating the US specimens as lectotypes.



(A, BISH, K, US, w); Sili, *Christophersen* 3200 (BISH); Salelologa, *Cox* 101 (BISH, GH); behind Sasina, *Cox* 242 (BISH, GH), 260 (BISH, GH); *sine loco*, *Graeffe* 144, *pro parte* (HBG), 216, *pro parte* (HBG), 217 (HBG), 220 (HBG); Patamea, *Rechinger* 1142 (w); various localities, *Vaupel* 11 (B, BISH, K, M, PTBG, US, WRSL); *sine loco*, *Vaupel* 11a (WRSL); behind Matautu, *Vaupel* 666 (B, BISH); behind Safai, *Vaupel* 677 (B); above Matavanu, *Vaupel* s.n. (PTBG); above Asau, *Whistler* 899 (B, BISH, K, PTBG, US); near Salelologa, *Whistler* 1215 (BISH, PTBG, US); above Asau, *Whistler* 1762 (PTBG). UPOLU: Mt. Vaea, *Christophersen* 452 (BISH, US); above Saluafata, *Christophersen* 539 (BISH), 541 (BISH); above Tafatafa, *Cox* 371 (BISH, GH, K); Moamoa, *Eames* 188 (BISH, K), 189 (BISH, GH); *sine loco*, *Funk* 196 (WRSL (fragment)); *sine loco*, *Graeffe* 37 (HBG), 37a (HBG), 90 (HBG), 212, *pro parte* (HBG), 213 (HBG), 1412 (K); near Apia, *Hochreutiner* 3217 (G); Papaseea, *Hochreutiner* 3229 (G, GH); Tiavi, *Rechinger* 374 (w), 406 (w); Laulii, *Rechinger* 895 (K), 899 (BM, US, w); above Motootua, *Rechinger* 1232 (BM, K, w); Mt. Vaea, *Rechinger* 1393 (w); near Malifa, *Rechinger* 1400 (w); near Utumapu, *Rechinger* 1532 (US); Mt. Vaea, *Reinecke* 152 (G, US (*pro parte*), WRSL); Utumapu, *Whistler* 670 (BISH, PTBG, US), 676 (B, BM, PTBG, US); Mt. Mariota, *Whistler* 754 (PTBG, US); above Luatuanuu, *Whistler* 1604 (B, BISH, PTBG), 1636 (B, BISH, K, PTBG, US); Mt. Tafuaupolu, *Whistler* 1665 (BISH, K, PTBG, US); near Amaile, *Whistler* 1836 (B, BISH, K, PTBG, US); below Utumapu, *Whistler* 1992 (B, BISH, K, PTBG); Taitoelau-Sigaele, *Whistler* 2038 (B, BISH, PTBG); above Apia, *Wilder* 80 (BISH). TUTUILA: Aua-Afono, *Garber* 841 (BISH); *sine loco*, *Graeffe* 37b (H), s.n. (K); Pago Pago, *Meebold* 8253 (BISH, K); Aoloaufou, *Whistler* 2730 (BISH, G, PTBG). WITHOUT FURTHER LOCALITY: *Graeffe* 173 (BM), s.n. (BM); *Kramer* s.n. (WRSL (fragment)); *Powell* 235 (K); *Whitmee* 66 (MEL), 167 (K, MEL), s.n. (BM, GH).

This species is very similar to the endemic *Psychotria samoana*, from which it differs principally in having larger leaves and inflorescences with more flowers. *Psychotria forsteriana* is one of the commonest of the *Psychotria* species in Samoa, perhaps second only to *P. insularum*.

*Reinecke* 383, collected on Mt. Fao, Upolu, could not be located and is probably lost.

3. ***Psychotria geminodens*** Schumann, Bot. Jahrb. Syst. **25**: 688. 1898; Rech. Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. **85**: 202. 1910; Christoph. Bernice P. Bishop Mus. Bull. **154**: 52. 1938. LECTOTYPE (here designated): Samoa, Upolu, Lepua [Lepue?], *Reinecke* 636 (G!).

Small tree 2–6 m tall. Stems glabrous; stipules lanceolate, acuminate, connate over half their length, 10–20 mm long. Leaves with petiole 4–18 mm long, glabrous; blade obovate to elliptic, 6–16 by 3–9 cm, apex acuminate to nearly rounded, base acute to attenuate, surfaces glabrous. Inflorescences terminal, many-flowered panicles 1.5–8 cm long, divided at base into 2 to 6 branches. Flowers with pedicel 2–5 mm long, glabrous; calyx campanulate, divided about halfway into 2 lobes, glabrous; corolla salverform, with tube 10–14 mm long and 4 lanceolate to ovate, recurved lobes 8–12 mm long that give upper portion of corolla distinctly 4-ribbed appearance before anthesis, green; stamens 4, epipetalous and partly exserted at top of tube, the anther linear-oblong, 3–4 mm long, the filament ca.  $\frac{1}{2}$  as long as anther; style shorter than tube, included, stigma lobes ca. 1 mm long. Fruits obovoid, 13–17 mm long excluding persistent, 2-lobed calyx 3.5–5.5 mm long, red at maturity.  $n = 11$  (*Whistler* 1575).



DISTRIBUTION. Endemic to Upolu; understory tree in foothill and montane forest; 200–800 m alt.

ADDITIONAL SPECIMENS EXAMINED. **Samoa.** UPOLU: above Malololelei, *Christophersen* 259 (A, BISH); Lanotoo, *Rechinger* 762 (w), 1834 (w); Utumapu, *Whistler* 684 (BM, PTBG, US); Mt. Fiamoe, *Whistler* 1175 (B, BISH, K, PTBG, US); Lanoataata, *Whistler* 1505 (BISH, PTBG, US); Afulilo, *Whistler* 1575 (BISH, K, PTBG); above Luatuanuu, *Whistler* 1603 (B, BISH, PTBG); Lanotoo, *Whistler* 2172 (PTBG); Olomaga, *Whistler* 3884 (PTBG); above Togitogiga, *Whistler* 3910 (BISH, PTBG, US).

This is the only species of the genus in Samoa to have a 2-lobed calyx. Its flowers are similar to those of the other 4-merous species of *Psychotria*, and it is probably related to them.

4. ***Psychotria savaiiensis*** Rech. Feddes Repert. Spec. Nov. Regni Veg. **6**: 327. 1909. TYPE: Samoa, Savaii, near Maugaafi, 1905, *Rechinger* 690 (holotype, w!).

*Calycodendron*(?) sp. of Christoph. Bernice P. Bishop Mus. Bull. **154**: 64. 1938.

Small tree 1.5–4 m tall. Stems glabrous; stipules acute-tipped, connate over half their length, 8–16 mm long. Leaves with petiole 4–8 mm long, glabrous; blade obovate to elliptic, 20–30 by 8–16 cm, apex acuminate to cuspidate, base acute, surfaces glabrous. Inflorescences compact, short-stalked panicles from upper axils, 2–4 cm long, bearing 10 to 20 flowers. Flowers with pedicel 2–6 mm long, glabrous; calyx campanulate, 6–9 mm long, divided about  $\frac{1}{3}$  of its length into 4 acute lobes; corolla salverform with narrow tube 12–18 mm long and 4 elliptic to ovate, spreading to recurved lobes 8–12 mm long that give upper portion of corolla distinctly 4-ribbed appearance before anthesis, white; stamens 4, epipetalous in upper throat, partially exserted, the anther subsessile, linear, 7–9 mm long; style included, about  $\frac{1}{2}$  as long as corolla, stigma lobes 1–2 mm long. Fruits ellipsoid to obovoid, 15–30 mm long excluding persistent cuplike calyx, red to purple at maturity, longitudinally ribbed when dry.

DISTRIBUTION. Endemic to Savaii and Upolu; understory tree in montane forest; 500–800 m alt.

ADDITIONAL SPECIMENS EXAMINED. **Samoa.** SAVAII: above Salailua, *Christophersen* 2743 (BISH, PTBG); Siuvao-Auala, *Christophersen* 3289 (BISH); above Asau, *Whistler* 14 (BISH, PTBG), 896 (PTBG), 1745 (B, BISH, BM, K, PTBG, US). UPOLU: Mt. Sigale, *Whistler* 2052 (PTBG).

Rechinger described this species in 1909 but omitted it from his 1910 work. Christophersen collected it twice but, unaware that Rechinger had already described it, tentatively referred it to *Calycodendron*. However, both Fosberg (1941) and Darwin (1979) believed this genus to be indistinct from *Psychotria*, and Rechinger's name must stand. Even if *Calycodendron* were to be considered a distinct genus, *P. savaiiensis* would be unaffected since this species is more closely related to section *Eumachia* than it is to *Calycodendron* (A. C. Smith, pers. comm.).



5. **Psychotria sclerocarpa** Whistler, sp. nov.

?*Psychotria* sp. of Schumann, Bot. Jahrb. Syst. **25**: 689. 1898.

*Psychotria* sp. of Rech. Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. **85**: 203. 1910.

Differt a *P. carnea* fructu majore et calyce quasi integro longiore.

Small tree up to 6 m or more tall. Stems glabrous; stipules not seen. Leaves with petiole 2–4 cm long, glabrous; blade obovate, 12–24 by 7–13 cm, apex acuminate, base acute to cuneate, surfaces glabrous. Inflorescences terminal, few-flowered panicles 2–6 cm long, branching at base. Flowers with pedicel 2–6 mm long, glabrous; calyx campanulate, 6–8 mm long, subentire to irregularly serrate; corolla, stamens, and style not seen. Fruits ovoid, 15–20 mm long excluding persistent calyx, not obviously transversely ribbed when dry.

TYPE: Samoa, Savaii, above Ologogo, *Whistler 580* (holotype, PTBG!; isotypes, B!, K!, US!).

DISTRIBUTION. Endemic to Samoa (Savaii and possibly Upolu); understory tree in montane forest; ca. 700 m alt.

ADDITIONAL SPECIMENS EXAMINED. **Samoa**. SAVAII: *sine loco*, *Graeffe 1507* (HBG); near Matavanu, *Rechinger 3737* (w).

This species is very rare, having been collected only three or four times and never with flowers. Nevertheless, it probably belongs to section *Eumachia* and has four-merous flowers with the corolla ribbed prior to anthesis; it was placed in the key to species based on this assumption. *Psychotria sclerocarpa* is similar to *P. carnea* but differs in having a larger, subentire calyx and larger fruits. *Reinecke 142* (BISH, G), collected at Alofau on Upolu, appears to belong here; if so, the species occurs on both Savaii and Upolu. The epithet *sclerocarpa* was taken from an annotation on *Rechinger 3737*, but the species was never described.

6. **Psychotria chlorocalyx** Schumann, Bot. Jahrb. Syst. **25**: 688. 1898; Rech. Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. **85**: 202. 1910; Christoph. Bernice P. Bishop Mus. Bull. **154**: 50. 1938, *pro parte*. TYPE: Samoa, Upolu, Le Pua [Lepue?], *Reinecke 635* (lectotype, here designated, G!; isolectotype, WRS!).

Small tree 1.5–3 m tall. Stems glabrous; immature stipules linear-lanceolate, connate at base, 6–12 mm long; mature ones not seen. Leaves with petiole 5–15 mm long, glabrous; blade elliptic, 8–15 by 2.5–5.5 cm, the apex acute to acuminate, the base acute, the surfaces pale green with yellow veins, glabrous. Inflorescences widely branching terminal panicles 7–15 cm long, bearing 15 to 50 flowers. Flowers with pedicel 1–3 mm long, densely puberulent; calyx rotate, split to near base into 4 reflexed, ovate lobes 1.5–3 mm long; corolla salverform with tube 8–12 mm long and 4 spreading, elliptic lobes 4–6 mm long that give upper portion of corolla distinctly 4-ribbed appearance before anthesis; stamens



4, epipetalous at top of tube, included, the anther linear-oblong, 2.5–3.5 mm long, subsessile; style shorter than tube, stigma lobes 1–1.5 mm long. Fruits oblong to pyriform, 10–16 mm long excluding persistent calyx, red at maturity, longitudinally ribbed when dry.

TYPIIFICATION. Schumann listed two specimens, but these were probably destroyed at Berlin. However, there are duplicates of *Reinecke 242* (listed by Schumann as *241*) at G and US, and *Reinecke 635* at G and WRSL. I have designated *Reinecke 635* (G), collected from “Le Pua” (Lepue?), Upolu, as the lectotype.

DISTRIBUTION. Endemic to Upolu; foothill to montane forest, mostly in central portion of island; 350–500 m alt.

ADDITIONAL SPECIMENS EXAMINED. **Samoa.** UPOLU: above Utumapu, *Rechinger 1570* (BM), *1686* (W); Mt. Vaea, *Reinecke 152, pro parte* (US), *242* (G, US); above Utumapu, *Whistler 1991* (BM, K, PTBG, US).

## 7. *Psychotria vaupelii* Whistler, sp. nov.

*Psychotria chlorocalyx* sensu Christoph. Bernice P. Bishop Mus. Bull. **154**: 50. 1938, *pro parte*, non Schumann.

*Psychotria chlorocalyx* affinis, a qua imprimis in foliis angustioribus, calyce et pedicello quasi glabris, et corolla longiore differt.

Shrub or small tree 1.5–4 m tall. Stems glabrous; stipules linear-lanceolate, connate at base, 6–12 mm long. Leaves with petiole 4–20 mm long, glabrous; blade narrowly elliptic to subfalcate, 7–16 by 1.5–3.5 cm (4–7 times longer than wide), the apex acuminate to attenuate, the base acute, the surfaces light green with yellow veins, glabrous. Inflorescences terminal, widely branching panicles 6–14 cm long, bearing 5 to 25 flowers. Flowers with pedicel 3–16 mm long, glabrous to puberulent; calyx rotate, split more than halfway into 4 ovate to triangular lobes 2–4 mm long, glabrous to puberulent on outside, subglabrous within; corolla salverform with tube 10–15 mm long and 4 elliptic lobes 7–10 mm long that give upper portion of corolla distinctly 4-ribbed appearance before anthesis, greenish; stamens 4, epipetalous in top of tube, partially exserted, the anther linear-oblong, 2.5–3.5 mm long, subsessile; style shorter than tube, stigma lobes 1–2 mm long. Fruits oblong to pyriform, 12–16 mm long excluding reflexed sepals, red at maturity, longitudinally ribbed when dry.

TYPE: Samoa, Savaii, above Ologogo, *Whistler 499* (holotype, PTBG!; isotype, BISH!).

DISTRIBUTION. Endemic to Savaii; understory tree in montane forest; 700–900 m alt.

ADDITIONAL SPECIMENS EXAMINED. **Samoa.** SAVAII: above Matavanu, *Christophersen 2291* (A, BISH, K, US); above Salailua, *Christophersen 2906* (BISH); above Gagamalae, *Christophersen 3439* (BISH); *sine loco*, *Graeffe 1500* (HBG); Maugaloa, *Vaupel 635* (B, M); above Asau, *Whistler 1748* (K, PTBG).



This species is similar to *Psychotria chlorocalyx* but differs in having generally narrower leaves, nearly glabrous pedicels and calyces, and larger flowers. *Whistler 1748* appears to have infertile or diseased flowers.

Two other specimens should be mentioned here. *Whistler 1760* (B, BISH, K, PTBG) and *1761* (BISH, BM, PTBG, US), both collected above Asau, Savaii, appear to be hybrids intermediate between *P. vaupelii* and some other species, perhaps *P. savaiiensis*. Both of these possible parental species were collected on the same day in the same area (*Whistler 1745* and *1748*).

The species is named in honor of Dr. Friedrich Vaupel for his important botanical collections (which include a specimen of this species) made in Samoa from 1904 to 1906.

**8a. *Psychotria carnea* (Forster f.) A. C. Smith subsp. *carnea*, Bernice P. Bishop Mus. Bull. 141: 151. 1936; Christoph. Bernice P. Bishop Mus. Bull. 154: 49. 1938; Yuncker, Bernice P. Bishop Mus. Bull. 220: 255. 1959.**

*Petesia carnea* Forster f. Fl. Ins. Austral. Prodr. 10. 1786. *Eumachia carnea* (Forster f.) DC. Prodr. 4: 479. 1830. LECTOTYPE (here designated): Tonga, Namuka, *Forster 51* (BM!).

*Chasalia pyriformis* A. Gray, Proc. Amer. Acad. Arts 4: 43. 1860. TYPE: Samoa, without further locality, 1839, *U. S. Expl. Exped. s.n.* (holotype, US?).

Small tree 2–5 m tall. Stems glabrous; young stipules linear and connate, mature ones not seen. Leaves with petiole 1.5–4.5 cm long, glabrous; blade obovate, 12–22 by 7–13 cm, apex acuminate, base acute to subattenuate, surfaces glabrous. Inflorescences broad, terminal panicles 3–8 cm long, bearing 15 to 30 flowers. Flowers with pedicel 3–10 mm long, glabrous; calyx campanulate to cup shaped, 3–5 mm long, shallowly divided into 4 broad lobes; corolla ca. 12–18 mm long (not seen mature), divided ca. halfway into 4 spreading to reflexed lobes that give upper portion distinct, 4-lobed appearance at anthesis, green, fleshy; stamens 4, epipetalous, included, the anther linear-oblong, 4–5 mm long, the filament ca.  $\frac{1}{2}$  as long as anther; style bifid at tip. Fruits obovate, 12–16 mm long (excluding calyx), red at maturity, finely longitudinally ribbed when dry, persistent cup-shaped calyx 5–7 mm wide.

TYPIFICATION. *Psychotria carnea* (*Petesia carnea*) is based on Forster's collection from Tonga in 1773. Two specimens of this are known to exist, an unnumbered one at K, and no. 51 collected from Namuka and stored at BM. I have designated the latter as lectotype. The type specimen of *Chasalia pyriformis*, collected by the U. S. Exploring Expedition, could not be located at GH or US and may be lost.

DISTRIBUTION. Indigenous to Samoa (Savaii), Tonga, and Fiji; understory shrub or small tree in foothill to montane forest; 250–450 m alt. (at least in Samoa).

ADDITIONAL SPECIMENS EXAMINED. **Samoa.** SAVAII: above Gatavai, *Bristol 2294* (BISH, GH, US); above Sasina, *Cox 243* (BISH, GH); Ologogo, *Vaupel 385* (B, M, US); above Asau, *Whistler 17* (BISH, PTBG); above Palauli, *Whistler 1246* (B, BM, PTBG, US).

A sterile specimen, *Christophersen 3209* (BISH), collected above Sili, Savaii, probably also belongs to this species.



8b. *Psychotria carnea* subsp. *oncocarpa* (Schumann) Whistler, comb. nov.

*Psychotria oncocarpa* Schumann, Bot. Jahrb. Syst. **25**: 688. 1898; Rech. Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. **85**: 203. 1910. LECTOTYPE (here designated): Samoa, Upolu, Vaialele?, *Reinecke 202* (G!).

*Psychotria carnea* sensu Christoph. Bernice P. Bishop Mus. Bull. **154**: 49. 1938, *pro parte*; sensu A. C. Smith, Bernice P. Bishop Mus. Bull. **141**: 151. 1936, *pro parte*.

Differs principally from subsp. *carnea* in having leaf blade elliptic, 8–16 by 4–8 cm, panicle 5–12 cm long, calyx 2–3.5 mm long, style as long as tube, stigma lobes 1–2 mm long, and fruits 10–15 mm long, orange at maturity, with persistent calyx 3–5 mm wide.

TYPIIFICATION. In his description of *Psychotria oncocarpa*, Schumann did not list any specimens, only the collection locality of Vaialele, Upolu. Two Reinecke specimens without locality (202 and 349, both at G) have been found. I have designated *Reinecke 202* (G) as the lectotype.

DISTRIBUTION. Endemic to Upolu and possibly Savaii;<sup>3</sup> understory tree in foothill to montane forest, 250–600 m alt.

ADDITIONAL SPECIMENS EXAMINED. **Samoa.** SAVAII: *sine loco*, *Graeffe 144*, *pro parte* (HBG), 216, *pro parte* (HBG). UPOLU: Moamoa, *Eames 202* (BISH, GH, K, US); *sine loco*, *Graeffe 7a* (HBG), 18c (HBG); Mt. Vaea, *Rechinger 1196* (BM, K), 1738 (W); above Utumapu, *Rechinger 1690* (BM, US, W); Vaialele(?), *Reinecke 349* (G); Mt. Mariota, *Whistler 817* (PTBG, US); Afulilo, *Whistler 1567* (BISH, K, PTBG). WITHOUT FURTHER LOCALITY: *Powell 345* (K).

9. *Psychotria bristolii* Whistler, sp. nov.

FIGURE 1.

Arbor 6–12 m alta. Folia elliptica, 14–26 cm longa et 2–8 cm lata; petiolus 4–8.5 cm longus. Inflorescentia multiflora, axillaris, 15–25 cm longa; pedunculus crassus. Calyx cupulatus, 3–5 mm longus. Corolla salverformis, tubo 3–4 cm longo, lobis 5, 12–18 mm longis. Fructus ellipsoideus, compressus, 20–33 mm longus, 2-costatus; calyx persistens.

Small to medium-sized tree 6–12 m tall. Stems glabrous; stipules connate their entire length to form cup-shaped to cylindrical sheath with truncate to rounded apex, 3.5–5 cm long. Leaves with petiole 4–8.5 cm long, glabrous; blade elliptic, 14–26 by 4–8 cm, apex acute to mucronate, base acute, surfaces glabrous. Inflorescences many-flowered, branching panicles 15–25 cm long on stout peduncle in upper axil. Flowers with pedicel 1–2 cm long, glabrous; calyx cup shaped, 3–5 mm long, margin entire or finely serrate; corolla salverform with tube 3–4 cm long and 5 spreading, linear-lanceolate lobes 12–18 mm long, white, glabrous inside and out; stamens 5, epipetalous in upper throat, partially exerted, the anther linear-oblong, 4–6 mm long, the filament ca. 1 mm long; style 3.5–4.5 cm long, slightly exerted, stigma lobes 2–3 mm long. Fruits

<sup>3</sup>Since the only record of this subspecies from Savaii is based on Graeffe's specimens, the data for which are sometimes erroneous, the species may actually be restricted to Upolu. Additionally, both of these Graeffe specimens are mixed.



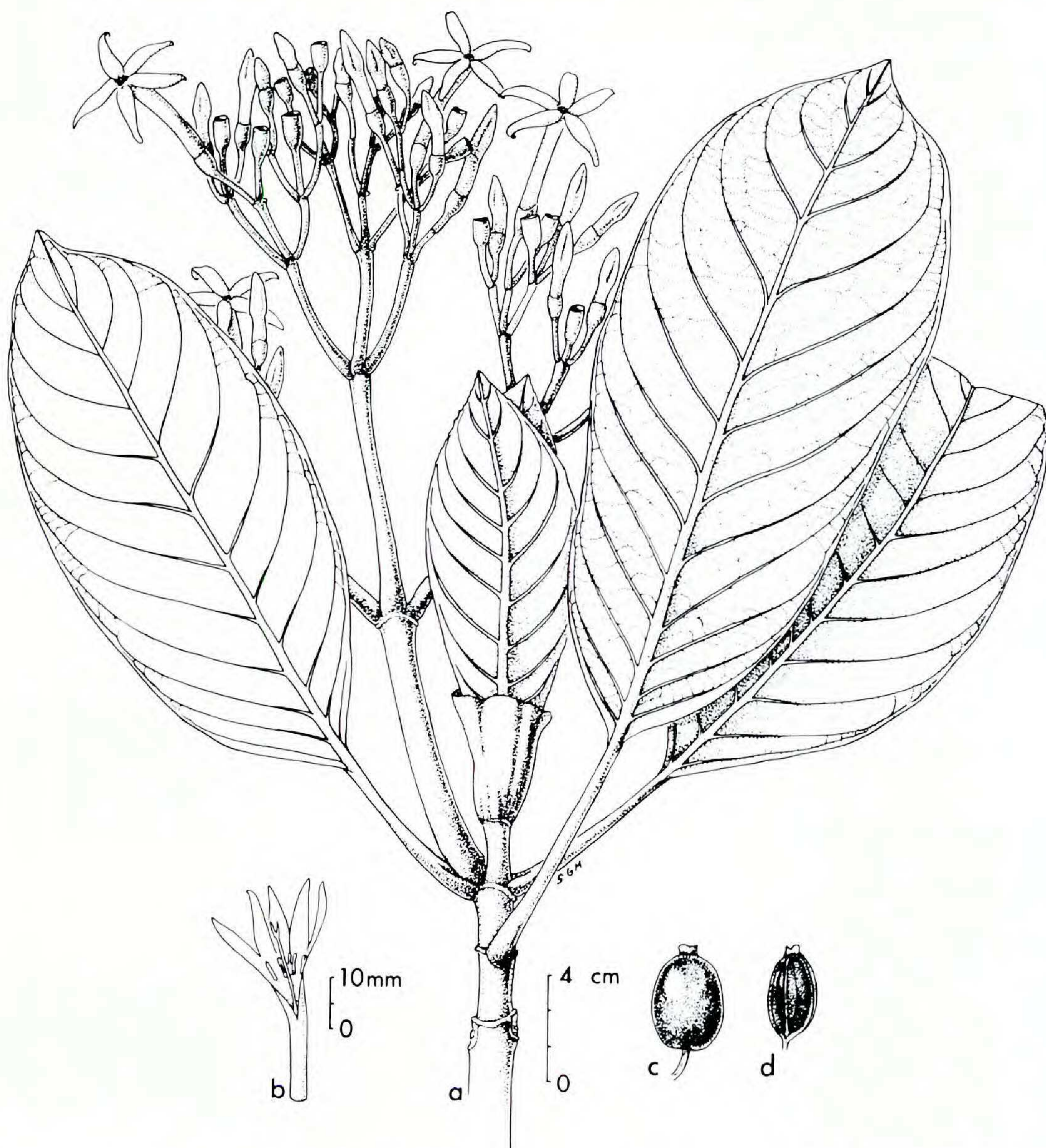


FIGURE 1. *Psychotria bristolii*: a, flowering stem; b, flower; c, fresh fruit; d, dry fruit.

ellipsoid, 20–33 mm long, laterally compressed with single prominent transverse rib on each pyrene face, crowned by persistent calyx.

TYPE: Samoa, Savaii, above Aopo, *Bristol 2162* (holotype, BISH!; isotypes, GH!, K!).

DISTRIBUTION. Endemic to Savaii; understory tree in montane to cloud forest; 900 m alt. Only three specimens are known, all collected on the north-central slopes of Savaii.

ADDITIONAL SPECIMENS EXAMINED. **Samoa.** SAVAII: above Matavanu, *Christophersen 2038* (BISH); above Asau, *Whistler 1754* (B, K, PTBG).

This species differs from any other *Psychotria* in Samoa, most strikingly by its large, ellipsoid fruit with a single transverse rib on each pyrene face, and



by its stout, axillary inflorescence with large, showy, white flowers. Of the other Samoan *Psychotria* species, only *P. grandistipulata* has flowers as large as these. *Psychotria bristolii* does not appear to have any close relatives in Samoa. It was first collected by Christophersen but was not mentioned in any of his publications. Both his specimen and the one collected by Bristol are in fruit, while *Whistler 1754* is in flower.

*Psychotria bristolii* is named in honor of Mel Bristol, who made an excellent collection of plants, including a specimen of this species, in Samoa in 1968.

10. ***Psychotria grandistipulata*** (Lauterbach) Whistler, comb. nov. FIGURE 2.

*Randia grandistipulata* Laut. Bot. Jahrb. Syst. **41**: 236. 1908; Rech. Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. **85**: 194. 1910. TYPE: Samoa, Savaii, above Aopo, *Vaupel 388* (holotype, WRSL!; isotypes, B!, BISH!, K!).

Small to medium-sized tree up to 10 m tall. Stems distinctly marked by annular stipule scars and leaf scars; stipules obovate, with rounded tip often recurved, connate entire length to form persistent, cup-shaped involucre (enclosing stem tip, young leaves, and base of inflorescence) 2–3 by 2.5–3.5 cm, whitish green, glabrous, often more than 1 present at a time. Leaves with petiole 1.5–5 cm long, glabrous; blade elliptic to oblanceolate, 8–24 by 2.5–7.5 cm, apex acute to acuminate, base acute, surfaces glabrous. Inflorescences panicles 3–10 cm long, arising in upper axil, with 3 to 10 flowers. Flowers with pedicel 3–20 mm long, with paired deciduous bracteoles up to 5 mm long at proximal end; calyx narrowly campanulate to urceolate, 10–15 mm long, shallowly 5-lobed, glabrous; corolla salverform with narrow tube 2–4.5 cm long and 5 linear-lanceolate, recurved lobes 2–3.5 cm long; stamens 5, epipetalous at top of throat, the anther linear-oblong, 4–6 mm long, subsessile; style shorter than tube, stigma lobes 2–4 mm long. Fruits ovoid to urceolate, 2.5–4.2 cm long including cylindrical, persistent calyx, dark purple at maturity, with single prominent transverse rib on each pyrene face when dry.

TIPIFICATION. *Psychotria grandistipulata* is based on *Vaupel 388*, collected in 1906 above Aopo. Lauterbach named this a *Randia*, but because there are only two ovules in the fruit, the species has to be a *Psychotria* instead. Rechinger followed Lauterbach without comment, and Christophersen, who collected it six times, labeled his specimens “*Randia?*” but for some reason did not mention them in his publications. Duplicates of *Vaupel 388* exist at B, BISH, K, and WRSL. I consider the sheet of *Vaupel 388* at WRSL to be the holotype.

DISTRIBUTION. Endemic to Savaii and Upolu; understory tree in montane forest; 500–1000 m alt.

ADDITIONAL SPECIMENS EXAMINED. **Samoa.** SAVAII: above Aopo, *Bristol 2150* (BISH, GH, K, PTBG, US); E of Olo, *Christophersen 2313* (BISH, K, US); Olo, *Christophersen 2514* (BISH, K, US); above Salilua, *Christophersen 2690* (BISH, K, US), *2944* (BISH, K, US); Siuvao-Auala, *Christophersen 3376* (BISH, K); Maugaafi, *Rechinger 64* (w), *1586* (w); above Ologogo, *Whistler 536* (BM, K, PTBG, US). UPOLU: above Malololelei, *Christophersen 233* (BISH); above Tapatapao, *Cox 128* (BISH, GH); Lanoanea, *Cox 149* (BISH, GH, K); Tiavi Pass, *Cox 178* (BISH, GH, K); Tiavi, *Whistler 1068* (B, K, PTBG, US), *2462* (BISH, K, PTBG); Lanoanea, *Whistler 1083* (PTBG); Lepue, *Whistler 4143* (B, BISH, PTBG, US).



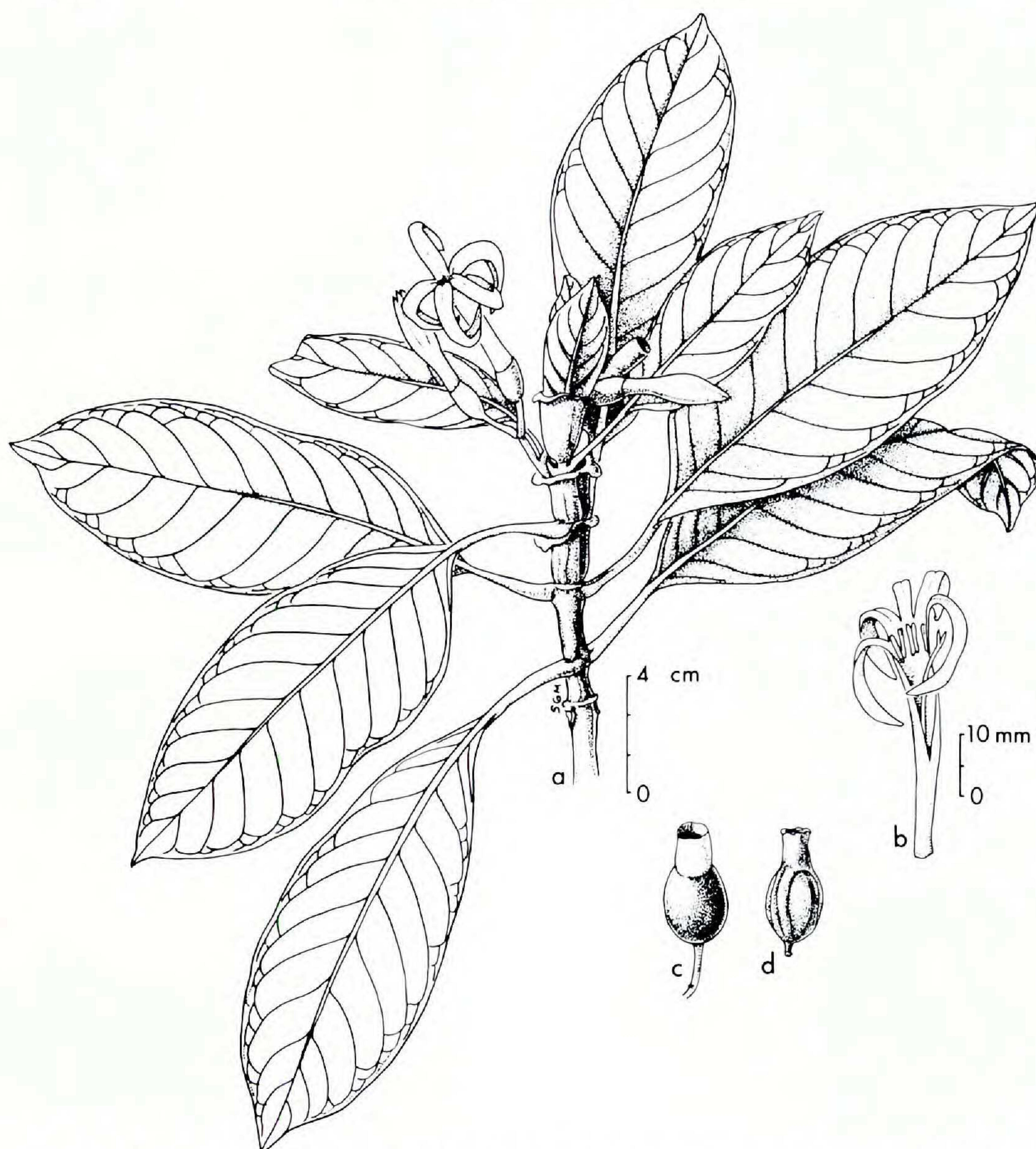


FIGURE 2. *Psychotria grandistipulata*: a, flowering stem; b, flower; c, fresh fruit; d, dry fruit.

This species differs most notably from any other in Samoa by its connate, whitish green stipules that form a cup-shaped involucre with the tip often recurved, and by its often-purplish fruits. Also, it has the largest flowers of any species of *Psychotria* in Samoa.

11. *Psychotria juddii* Christoph. Bernice P. Bishop Mus. Bull. **154**: 56. 1938.  
 TYPE: Samoa, Savaii, forest above Gagamalae, above 900 m, 1931,  
*Christophersen 3424* (holotype, BISH!; isotypes, A!, K!).

Small tree up to 6 m tall. Stems glabrous, leaves concentrated at ends of branches; stipules lanceolate, split at tip into 2 short lobes, connate over half their length, 15–30 mm long. Leaves with petiole 2–6 cm long, glabrous; blade oblong to elliptic or slightly obovate, 14–32 by 5.5–11 cm, apex acute to



acuminate, base acute or short-attenuate, surfaces glabrous. Inflorescences solitary erect globose heads 2.5–3 cm across, bearing up to 45 flowers, the peduncle 2–4.5 cm long, covered with reddish brown hairs. Flowers with calyx cup shaped, shallowly divided into 5 obtuse lobes, glabrous; corolla infundibular with tube 35–45 mm long and 5 fleshy, recurved linear lobes up to 2 cm long, white, scurfy-pubescent on outside, densely pubescent within; stamens 5, epipetalous in middle of throat, the anther linear-oblong, 2–3 mm long, the filament 6–7 mm long; style as long as tube, stigma lobes up to 5 mm long. Fruits globose, ca. 3.5 cm in diameter including persistent fleshy calyx, red at maturity, not obviously longitudinally ribbed when dry.

DISTRIBUTION. Endemic to Savaii; understory tree in cloud forest; above 900 m alt.

ADDITIONAL SPECIMEN EXAMINED. **Samoa.** SAVAII: above Salailua, *Christophersen 2706* (BISH).

This rare species has been collected only twice, both times by Christophersen. With its capitate inflorescences, it does not appear to be closely related to any other Samoan species of *Psychotria*.

12. ***Psychotria gigantopus*** Schumann, Bot. Jahrb. Syst. **25**: 686. 1898; Christoph. Bernice P. Bishop Mus. Bull. **154**: 53. 1938. NEOTYPE (here designated): Samoa, without further locality, *Reinecke 459* (WRSL (fragment)).

Small tree up to 5 m tall. Stems 6–10 mm thick, glabrous, with leaves clustered at ends; stipules not seen. Leaves appearing nearly whorled; petiole 3–16 mm long, glabrous; blade oblanceolate, 18–45 by 5–11 cm, apex acuminate, base cuneate to rounded, surfaces glabrous. Inflorescences drooping, terminal panicles 20–40 cm long, bearing subumbellate clusters of 12 to 24 flowers on whorled branches congested on upper half of peduncle. Flowers with pedicel 1–10 mm long, glabrous; calyx campanulate to cylindrical, 5–9 mm long, shallowly divided into 5 lobes less than 1 mm long, glabrous; mature corolla unknown, probably tubular, white, 5-lobed; stamens 5, epipetalous, the anther oblong, 2–3 mm long, the filament short; mature style unknown. Fruits oblong to obovoid, 2.5–3.5 cm long excluding persistent calyx, red at maturity, shallowly longitudinally ridged when dry.

TYPIIFICATION. *Psychotria gigantopus* was based on *Reinecke 633*, collected at “Lona Fai” on Upolu in 1895. Christophersen (1938) noted seeing this specimen at B (now destroyed), as well as another one, *Reinecke 459*. The latter one was not mentioned by Schumann, and in fact the number is ascribed by Reinecke to a specimen belonging to an entirely different family. A fragment of it (indeed this species) is located at WRSL, and I have designated this specimen to be the neotype.

DISTRIBUTION. Endemic to Samoa; understory tree in cloud forest of Upolu and Savaii; 700–1200 m alt.



ADDITIONAL SPECIMENS EXAMINED. **Samoa.** SAVAII: Mauga Mu, *Baker s.n.* (PTBG); above Matavanu, *Christophersen 834* (A, BISH), *2125* (BISH, K), *2194* (A, BISH, K); Maugaloa, *Vaupel 402* (B, M). UPOLU: above Falemauga, *Cox 30* (BISH, GH). WITHOUT FURTHER LOCALITY: *Whitmee 138* (MEL).

This species differs from any other in Samoa in having large panicles with subumbellate clusters of flowers, and large, oblanceolate leaves appearing to be whorled at the ends of the branches.

13. ***Psychotria closterocarpa*** A. Gray, Proc. Amer. Acad. Arts **4**: 44. 1860; Christoph. Bernice P. Bishop Mus. Bull. **154**: 50. 1938. TYPE: Samoa, without further locality, 1839, *U. S. Expl. Exped. s.n.* (holotype, US 62348!; isotype, GH!).

*Psychotria dolichocarpa* Schumann, Bot. Jahrb. Syst. **25**: 686. 1898; Rech. Denkschr. Kaiserl. Acad. Wiss., Math.-Naturwiss. Kl. **85**: 200. 1910. LECTOTYPE (here designated): Samoa, Upolu, Lonaifai and Lepua [Lepue?], 1895, *Reinecke 634* (G!).

Small tree 3–6 m tall. Stems glabrous; stipules obovate, connate for over half their length, up to 3 cm long. Leaves with petiole 5–9 cm long, glabrous; blade elliptic to obovate, 20–35 by 4–13 cm, apex acuminate to nearly rounded, base acute, surfaces glabrous. Inflorescences terminal panicles 10–20 cm long, often branching near base, bearing 40 to 150 flowers. Flowers with pedicel 1–7 mm long, glabrous; calyx campanulate, 3.5–5.5 mm long, entire to shallowly 5-lobed; corolla tubular with tube 20–25 mm long and 5 (rarely 6) lanceolate spreading lobes 4.5–6.5 mm long, white; stamens 5 (rarely 6), epipetalous in upper throat, partially exserted, the anther linear-oblong, 2–3.5 mm long, the filament ca.  $\frac{1}{2}$  as long as anther; style shorter than tube, stigma lobes 4–6 mm long. Fruits ellipsoid, 15–20 mm long excluding persistent calyx, orange at maturity, longitudinally ribbed when dry.  $n = 22$  (*Whistler 1643*).

DISTRIBUTION. Endemic to Savaii and Upolu; understory tree in montane to cloud forest; 550–1200 m alt.

ADDITIONAL SPECIMENS EXAMINED. **Samoa.** SAVAII: above Aopo, *Bristol 2148* (BISH, GH, K); above Gataivai, *Bristol 2277* (BISH); above Patamea, *Bristol 2325* (BISH); above Salailua, *Christophersen 2917* (BISH, K), *3068* (BISH, US); above Gagamalae, *Christophersen 3440* (BISH); above Sasina, *Cox 257* (BISH, GH, K); *sine loco*, *Graeffe 119* (HBG); above Ologogo, *Whistler 544* (B, BM, PTBG, US). UPOLU: near Malololelei, *Christophersen 312* (BISH); above Saluafata, *Christophersen 524* (A, BISH, M); Tapatapao, *Cox 138* (BISH, GH, K), *392* (GH); *sine loco*, *Graeffe 40* (W); *sine loco*, *Kramer s.n.* (WRSL (fragment)); near Tiavi, *Rechinger 439* (W), *454* (W); Lanotoo, *Rechinger 457* (W), *1808* (W), *1846* (W); Afiamalu, *Whistler 804* (B, BISH, PTBG, US); Lanoataata, *Whistler 1504* (BISH, PTBG, US); near Tiavi, *Whistler 1643* (B, BISH, K, PTBG, US); SE of Mt. Mariota, *Whistler 1895* (BISH, PTBG). WITHOUT FURTHER LOCALITY: *Reinecke s.n.* (WRSL).

14. ***Psychotria pacifica*** Schumann, Bot. Jahrb. Syst. **25**: 687. 1898; Rech. Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. **85**: 200. 1910; Christoph. Bernice P. Bishop Mus. Bull. **154**: 57. 1938. TYPE: Samoa, Upolu, above Vailele, *Reinecke 318* (lectotype, here designated, G!; isotypes, K!, US!, WRSL!).



*Psychotria stenocarpa* Schumann, Bot. Jahrb. Syst. **25**: 687. 1898. Christoph. Bernice P. Bishop Mus. Bull. **154**: 58. 1938. Var. *typica* Hochr. Candollea **5**: 269. 1934. TYPE: Samoa, Savaii, mountain region, 1894, *Reinecke* 348 (B, presumably destroyed).

*Psychotria stenocarpa* subsp. *montivaga* Rech. Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. **85**: 201. 1910. TYPE: Samoa, Savaii, in deep forest on Mt. Maugaafi, ca. 1200 m alt., 1905, *Rechinger* 412 (holotype, w).

*Psychotria loniceroides* Rech. Feddes Repert. Spec. Nov. Regni Veg. **6**: 328. 1909; Rech. Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. **85**: 200. 1910. TYPE: Samoa, near Maugaafi, ca. 1500 m alt., 1905, *Rechinger* 1075 (holotype, w).

*Psychotria upoluensis* Christoph. Bernice P. Bishop Mus. Bull. **154**: 61. 1938. TYPE: Samoa, Upolu, forest on Maugatele ridge above Saluafata, 600 m alt., 1929, *Christophersen* 532 (holotype, BISH).

Shrub or small tree 1–6 m tall. Young stems, petioles, and peduncles glabrous or sparsely covered with short, erect, reddish brown hairs; stipules lanceolate with 2 acute lobes, connate for about half their length, 10–18 mm long. Leaves with petiole 1–5 cm long; blade lanceolate to oblanceolate, 8–20 by 1.8–6 cm (2.5–5 times longer than wide), the apex acuminate, the base acute, the surfaces glabrous, sometimes reddish and mottled when dried (usually those specimens with reddish brown hairs). Inflorescences terminal panicles 1–5 cm long with 1 to 5 simple or branched peduncles bearing up to 80 subsessile flowers in dense, compact umbels. Flowers with calyx campanulate, 2.5–3.5 mm long, shallowly divided into 5 rounded to triangular lobes; corolla tubular with tube 15–25 mm long and 5 lobes 5–8 mm long, white, usually glabrous on outside, densely pilose to subglabrous within; stamens 5, epipetalous in upper throat, included to slightly exserted, the anther linear-oblong, 2–3 mm long, the filament less than  $\frac{1}{2}$  as long as anther; style about as long as corolla, exserted, stigma lobes 1–2 mm long. Fruits ovoid, 10–15 mm long excluding persistent calyx, red to orange at maturity, longitudinally ribbed when dry.

TIPIFICATION. Schumann cited three specimens in his description of the species. Duplicates exist for all three, and I have designated *Reinecke* 318 (G), collected in 1894 above Vailele, Upolu, as the lectotype. Isolectotypes of this are at K, US, and WRSL.

DISTRIBUTION. Probably endemic to Savaii and Upolu;<sup>4</sup> understory tree in foothill to cloud forest; 350–1500 m alt.

ADDITIONAL SPECIMENS EXAMINED. **SAMOA.** SAVAII: above Aopo, *Bristol* 2149 (BISH, GH, K); above Salailua, *Bryan* 171 (BISH); above Letui, *Christophersen* 737 (BISH), 740 (BISH); near Mataulano Lake, *Christophersen* 877 (BISH); above Matavanu, *Christophersen* 1985 (A, BISH); NE of Salailua, *Christophersen* 2569 (A, BISH, K, US, w); above Salailua, *Christophersen* 2694 (A, BISH), 2739 (BISH, K, US); above Sasina, *Cox* 241 (BISH, GH), 259 (BISH, GH); *sine loco*, *Graeffe* 137 (HBG); Maugaafi, *Rechinger* 412 (w); near Maugaafi, *Rechinger* 1075 (w); near Aopo, *Rechinger* 1603 (w); *sine loco*, *Vaupel* 73 (B); Maugaloa, *Vaupel* 450 (B, BISH, K, US), 488 (B, M, US); Sologa, *Vaupel* 638 (M); above Ologogo, *Whistler* 517 (B, BISH, PTBG, US); above Asau, *Whistler* 1763 (B, BISH, BM, K, PTBG, US). **UPOLU:**

<sup>4</sup>One specimen collected by Graeffe over a century ago was labeled as being from Tutuila, but since many of Graeffe's localities have proved to be erroneous and the species has not been collected on that island again, it is doubtful if it ever occurred there.



Malololelei–Lanotoo trail, *Christophersen* 395 (BISH); above Eva, *Christophersen* 527 (A, BISH, K); Maugatele Ridge, *Christophersen* 532 (BISH), 540 (A, BISH, K); Lanoanea, *Cox* 150 (GH); Lepue, *Cox* 203 (GH); *sine loco*, *Graeffe* 15 (w), 17ii (HBG), 112 (BM), 1368 (HBG, K), *s.n.* (K); Lanotoo, *Hochreutiner* 3241 (G); near Tiavi, *Rechinger* 400 (BM, K, US, w), 444 (w), 462 (BM, w), 1315 (w); near Lanotoo, *Rechinger* 1849 (w); near Lanotoo, *Reinecke* 320 (G); Tofua, *Reinecke* 320a (G); Mt. Fito–Lepue, *Sledge s.n.* (K); near Lanotoo, *Whistler* 271 (PTBG); Mt. Sigaele, *Whistler* 352 (B, BISH, PTBG, US); near Lemafa Pass, *Whistler* 438 (BISH, PTBG); near Utumapu, *Whistler* 686 (B, BISH, PTBG, US); near Lepue, *Whistler* 737 (B, BISH, PTBG, US); rim of Mt. Fiamoe, *Whistler* 1162 (PTBG); below Lanoataata, *Whistler* 1487 (B, BISH, K, PTBG, US); near Tiavi, *Whistler* 1644 (B, BISH, K, PTBG, US); SE of Mt. Mariota, *Whistler* 1921 (PTBG); rim of Mt. Fiamoe, *Whistler* 2006 (BISH, PTBG); rim of Mt. Taitoelau, *Whistler* 2055 (PTBG); S of Mt. Fito, *Whistler* 3979 (BISH, PTBG); above Apia, *Wilder* 418a (BISH), 418b (BISH). TUTUILA: *sine loco*, *Graeffe* 1383 (HBG, K). WITHOUT FURTHER LOCALITY: *Whitmee* 81 (K, MEL (mix)), 101 (BM, K, MEL), 129 (K).

Schumann named *Psychotria pacifica* based on three specimens, and *P. stenocarpa* based on one. This last specimen, *Reinecke* 348, collected in the mountain region of Savaii, has been lost, but on the basis of Schumann's descriptions, the differences between the two species do not seem to be significant. Christophersen, who described *P. upoluense*, noted only that his species differed in having the corolla pubescent on the outside, but this difference is well within the range of variation of *P. pacifica*. *Psychotria loniceroides* and *P. stenocarpa* subsp. *montivaga*, both described by Rechinger, also appear to differ little from *P. pacifica*. The species is quite variable in foliage and pubescence, but the panicle of subumbellate clusters is distinctive. One specimen that is particularly anomalous, however, is *Vaupel* 488. It is more densely red-hairy than any other specimens seen, and its leaves are up to 9 cm wide (vs. less than 6 cm in other specimens). However, because of the variability of this species, it seems unwise at this time to deal with this single specimen other than to mention it.

15. ***Psychotria apodantha*** A. Gray, Proc. Amer. Acad. Arts 4: 46. 1860; Christoph. Bernice P. Bishop Mus. Bull. 154: 48. 1938. TYPE: Samoa, without further locality, 1839, *U. S. Expl. Exped. s.n.* (holotype, US 67258!; isotype, GH (fragment)!).

*Psychotria angustissima* Rech. Feddes Repert. Spec. Nov. Regni Veg. 6: 327. 1909; Rech. Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. 85: 201. 1910. TYPE: Samoa, Savaii, forest near Patamea, 1905, *Rechinger* 1141 (holotype, w!).

Shrub or small tree 1–2 m tall. Young stems densely covered with erect, reddish brown hairs; stipules divided into 2 linear to lanceolate lobes, connate for most of their length, up to 2 cm long, margin usually densely hairy. Leaves with petiole 0.8–2 cm long, sparsely to densely covered with erect reddish brown hairs up to 2 mm long; blade lanceolate, 8–17 by 0.8–3 cm (5–10 times longer than wide), apex attenuate, base acute, upper surface subglabrous to sparsely appressed-hairy, lower surface glabrous or with few scattered hairs on basal midvein. Inflorescences terminal solitary umbels bearing up to 10 subsessile flowers. Flowers with calyx campanulate, 4.5–6 mm long, shallowly



divided into 5 triangular lobes up to 1 mm long, subglabrous to hirsute; corolla tubular with tube 18–23 mm long and 5 spreading lobes 6–9 mm long, white, subglabrous on outside, densely pilose within; stamens 5, epipetalous in upper throat, the anther linear, 2–3 mm long, filament less than  $\frac{1}{2}$  as long as anther; style up to 24 mm long, included, stigma lobes ca. 2–3.5 mm long. Fruits obovoid, 8–12 mm long excluding persistent calyx, red at maturity, pubescent when young, longitudinally ribbed when dry.

**DISTRIBUTION.** Endemic to Savaii and Upolu; understory shrub in coastal to lowland forest near coast, mostly on old lava flows below 75 m elevation. The single specimen collected on Upolu, however, was from montane forest on an old cinder cone at 650 m alt.; one from Savaii (*Christophersen 2751*) was collected at 1200–1300 m.

**ADDITIONAL SPECIMENS EXAMINED.** **Samoa.** SAVAII: Salailua, *Bryan 168* (BISH); Lealatele, *Christophersen 2472* (A, BISH, US); above Salailua, *Christophersen 2751* (BISH); Salailua-Lataiuta, *Christophersen 2872* (BISH, K); Sili-Lataiuta, *Christophersen 3138* (BISH); Faala-Tafuatai, *Cox 107* (BISH, GH, K); *sine loco*, *Reinecke s.n.* (WRSL (fragment)); Tafuatai, *Whistler 1222* (B, BISH, PTBG, US). UPOLU: SE of Mt. Mariota, *Whistler 1905* (B, BISH, K, PTBG). WITHOUT FURTHER LOCALITY: *Whitmee 57* (K), *s.n.* (BM).

*Psychotria apodantha* is most closely related to *P. pacifica*, from which it most obviously differs in having narrower leaves and sessile, unbranched inflorescences. *Reinecke 420*, collected on Savaii without further locality, could not be found and is probably lost.

16. ***Psychotria reineckei*** Schumann, Bot. Jahrb. Syst. **25**: 686. 1898; Rech. Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. **85**: 199. 1910; Christoph. Bernice P. Bishop Mus. Bull. **154**: 58. 1938. TYPE: Samoa, Savaii, central mountains, 1894, *Reinecke 423* (lectotype, here designated, BISH!; isoelectotypes, BM!, G!, WRSL!).

*Psychotria elegantula* Rech. Feddes Repert. Spec. Nov. Regni Veg. **7**: 168. 1909; Rech. Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. **85**: 199. 1910; Hochr. Candollea **5**: 269. 1934. TYPE: Samoa, Upolu, forest near Lanotoo, ca. 700 m alt., 1905, *Rechinger 151* (holotype, w!).

Small tree 2–4 m tall. Stems glabrous; stipules obovate with 2 acute to mucronate lobes, connate for over half their length to form campanulate sheath, 2–5 cm long. Leaves with petiole 1–5 cm long, glabrous; blade lanceolate to oblanceolate, 6–26 by 2.5–6.5 cm, the apex acuminate, the base acute, the surfaces glabrous, drying reddish brown or mottled. Inflorescences terminal, many-flowered panicles 3–7 cm long, with 1 to 3 branches at base. Flowers with pedicel 3–12 mm long, glabrous; calyx cylindrical, 6–9 mm long, divided about halfway into (4 or) 5 (or 6) oblong lobes, white, not persisting on fruit; corolla tubular with tube 11–16 mm long and 5 linear-oblong lobes 7–10 mm long, white; stamens (4 or) 5 (or 6), epipetalous in upper throat, mostly included, the anther oblong, 3–4 mm long, filament 3–5 mm long; style about as long as tube, stigma lobes 2.5–4 mm long. Fruits ovoid, 10–14 mm long, pink to flesh colored at maturity, shallowly 3- or 4-ribbed on each pyrene face when dry.



TYPIIFICATION. *Psychotria reinecke* was based on *Reinecke* 423, collected in the central mountain region of Savaii in 1894. The holotype at B was presumably destroyed, but there are duplicates at BISH, BM, G, and WRS. *Reinecke* 423 at BISH is hereby designated as the lectotype.

DISTRIBUTION. Endemic to Savaii and Upolu; understory tree in montane to cloud forest; 600–1700 m alt.

ADDITIONAL SPECIMENS EXAMINED. **Samoa.** SAVAII: above Aopo, *Bristol* 2126 (BISH, GH, K); *sine loco*, *Vaupel* 80 (B); Maugaloa, *Vaupel* 636 (B, M, PTBG); S of Mataana, *Vaupel* 669 (B). UPOLU: above Malololelei, *Christophersen* 258 (A, BISH), 265 (BISH, K, US); above Saluafata, *Christophersen* 531 (BISH); Lanotoo, *Hochreutiner* 3262 (G); Lanotoo, *Rechinger* 737 (w), 764 (w), 1907 (w), 1916 (w), 1958 (BM, w); Mt. Fito, *Whistler* 3964 (B, BISH, PTBG, US); Lepue, *Whistler* 4151 (BISH, PTBG, US). WITHOUT FURTHER LOCALITY: *Powell* 246 (K).

This species is distinctive with its white, oblong-lobed calyx and its large, campanulate stipule sheath.

17. ***Psychotria garberiana*** Christoph. Bernice P. Bishop Mus. Bull. **154**: 51. 1938; Yuncker, Bernice P. Bishop Mus. Bull. **184**: 65. 1945. TYPE: Samoa, Olosega, Olosegauta-Piumafua ridge, 500 m alt., 1925, *Garber* 1062 (holotype, BISH!).

Small tree 2–4 m tall. Stems glabrous; stipules elliptic with notched tip, connate over half their length, 6–16 mm long. Leaves with petiole 3–25 mm long, glabrous; blade elliptic to oblanceolate, 5–16 by 1.5–7 cm, the apex acute to subacuminate, the base acute to subattenuate, the surfaces glabrous, often drying to mottled reddish brown. Inflorescences terminal or upper-axillary panicles 3–6 cm long and nearly as wide, bearing 6 to 30 flowers, often branched at base. Flowers with pedicel 3–8 mm long, glabrous; calyx campanulate, 2.5–5 mm long, shallowly divided ca. 1 mm into 5 triangular lobes, glabrous; corolla tubular with narrow tube 13–20 mm long and 5 lanceolate lobes 4–8 mm long, white, glabrous on outside, villous within; stamens 5, epipetalous in upper throat, included, the anther oblong, 2–3 mm long, the filament  $\frac{1}{2}$  to nearly as long; style shorter than tube, stigma lobes 2–3 mm long. Fruits ovoid to subglobose, 8–12 mm long excluding persistent, cup-shaped calyx, orange to pink at maturity, longitudinally ribbed when dry.

DISTRIBUTION. Endemic to Manua (Ofu, Olosega, and Tau); understory tree in foothill to montane forest; 300–800 m alt.

ADDITIONAL SPECIMENS EXAMINED. **Samoa.** OFU: summit of island, *Whistler* 3030 (K, PTBG). OLOSEGA: Piumafua, *Whistler* 3078 (K, PTBG). TAU: summit, *Garber* 754 (BISH); above Luma, *Whistler* 1412 (B, BISH, G, PTBG, US); above Fitiuta, *Whistler* 3134 (PTBG); near summit, *Whistler* 3197 (B, K, PTBG). WITHOUT FURTHER LOCALITY: *Powell* 280 (K).

18. ***Psychotria christophersenii*** Whistler, sp. nov.

FIGURE 3.

*Psychotria* aff. *reinecke* sensu Christoph. Bernice P. Bishop Mus. Bull. **154**: 58. 1938.

Ad *Psychotria garberiana* affinis, a qua imprimis differt stipulis non fassis, corolla longiore, et fructu curvato longiore.



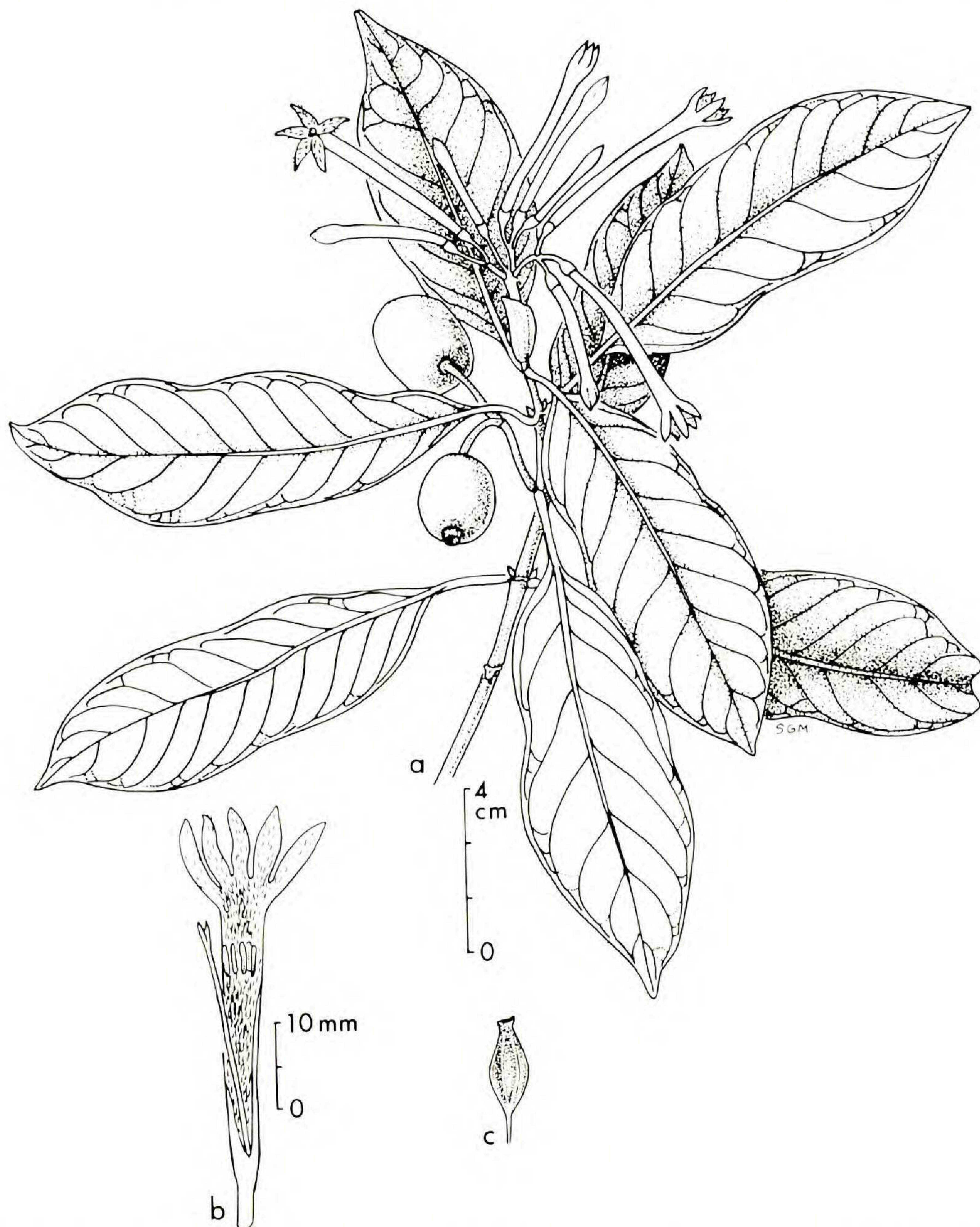


FIGURE 3. *Psychotria christophersenii*: a, flowering and fruiting branch; b, flower; c, dry fruit.

Shrub or small tree up to 5 m tall. Stems glabrous; stipules obovate with apex obtuse to rounded, connate for over half their length, 15–25 mm long. Leaves with petiole 1–2 cm long, glabrous; blade usually oblanceolate, 6–12 by 1.5–4.5 cm, the apex short-acute, the base acute, the surfaces glabrous, often drying mottled reddish brown. Inflorescences terminal or upper-axillary panicles 2–5 cm long, divided at base into 3 branches, each bearing 3 to 10 flowers. Flowers with pedicel 1–7 mm long, glabrous; calyx campanulate, 2–4 mm long, shallowly divided into 5 lobes up to 1 mm long, glabrous; corolla tubular with narrow tube 22–45 mm long and 5 lanceolate lobes 5–9 mm long, white, glabrous on outside, villous within; stamens 5, epipetalous in upper throat,



included, the anther linear-oblong, 3–4.5 mm long, the filament up to  $\frac{1}{2}$  as long; style shorter than tube, stigma lobes 2–4 mm long. Fruits narrowly ovoid and often somewhat curved, 12–18 mm long excluding persistent, cup-shaped calyx, pink at maturity, longitudinally ribbed when dry.

TYPE: Samoa, Savaii, S of Mt. Silisili, *Whistler 2666* (holotype, PTBG!; isotypes, B!, BISH!, K!).

DISTRIBUTION. Endemic to Savaii; understory tree in cloud forest; 1300–1700 m alt.

ADDITIONAL SPECIMENS EXAMINED. **Samoa.** SAVAII: above Letui, *Christophersen 774* (BISH); above Matavanu, *Christophersen 2272* (A, BISH); Safotu-Salailua, *Christophersen 2559* (BISH); Maugaafi, *Rechinger 634* (w), 1950 (w); central mountain region, *Vaupel 294* (B, K, M, WRSL (fragment)); W of Mt. Silisili, *Whistler 2521* (B, BISH, K, PTBG), 2666A (PTBG); SW of Mt. Silisili, *Whistler 2657* (PTBG).

*Psychotria christophersenii* is most closely related to *P. garberiana* but differs in having longer, elliptic to subcylindrical (vs. globose to subglobose) fruits, longer flowers, and longer, unnotched stipules. The fruit and calyx are very similar to those of *P. closterocarpa*, but otherwise the two species are quite different. Outside Samoa, *P. christophersenii* appears to be related to *P. grantii* Fosberg, of Tahiti, and *P. temehaniensis* J. W. Moore, of Raiatea.

*Psychotria christophersenii* was first collected by Vaupel in 1906 but was incorrectly identified as *P. reineckeii*. Christophersen, who collected it three or four times, was the first to recognize that a distinct species was involved, but since his specimens lacked flowers, he merely listed it as *P. aff. reineckeii*. *Christophersen 2143* (BISH), collected above Matavanu, Savaii, probably also belongs here, but its calyx is reminiscent of *P. xanthochlora*.

This species is named in honor of Erling Christophersen, whose work in Samoan botany is unequaled to this time.

19. ***Psychotria xanthochlora*** Schumann, Bot. Jahrb. Syst. **25**: 687. 1898; Rech. Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. **85**: 200. 1910; Christoph. Bernice P. Bishop Mus. Bull. **154**: 62. 1938. TYPE: Samoa, Upolu, above Saluafata, *Christophersen 526* (neotype, here designated, BISH!; isoneotypes, K!, US!).

Small tree 2–4 m tall. Stems glabrous; stipules ovate to elliptic with notched tip, connate for over half their length, 8–12 mm long. Leaves with petiole 8–20 mm long, glabrous; blade elliptic, 6–12 by 2–3.5 cm, the apex acute to subacuminate, the base acute, the surfaces glabrous, drying mottled reddish brown and gray. Inflorescences terminal or upper-axillary panicles 2–6 cm long, 3-branched from base, bearing 30 to 60 flowers. Flowers with pedicel 2–7 mm long, glabrous; calyx broadly cup shaped, 1–2 mm long, glabrous; corolla tubular with narrow tube 1–2 cm long and 5 spreading lanceolate lobes 2–6 mm long, white, glabrous outside, villous within; stamens 5, epipetalous in middle of tube, included, the anther linear-oblong, 1.5–2.5 mm long, the filament ca.  $\frac{1}{2}$  as long as anther; style about as long as tube, stigma lobes 1.5–2 mm long.



Fruits ovoid, 10–13 mm long excluding persistent cuplike calyx, red at maturity, longitudinally ribbed when dry.

TYPIIFICATION. *Psychotria xanthochlora* was based on *Reinecke 337*, collected in 1894 in the mountains above Laulii, Upolu, but this specimen has probably been destroyed. I have therefore designated *Christophersen 538*, which was collected near the type locality, as the neotype. Christophersen (1938) noted in his discussion of the species that this specimen closely agreed with the now-lost type specimen of Reinecke, which Christophersen saw in Berlin. The neotype is at BISH, with duplicates at K and US.

DISTRIBUTION. Endemic to Savaii and Upolu; understory tree in montane to cloud forest; 500–1520 m alt.

ADDITIONAL SPECIMENS EXAMINED. **Samoa.** SAVAII: above Matavanu, *Christophersen 1994* (A, BISH, K, US, W), *2012* (A, BISH, US), *2013* (BISH, K); Papaafu Crater, *Christophersen 2725* (BISH), *2731* (BISH); Aopo-Gagamalae, *Christophersen 3441* (A, BISH, K, US); S of Maugaloa, *Vaupel 469* (B, BISH, K, M). UPOLU: above Saluafata, *Christophersen 526* (A, BISH). WITHOUT FURTHER LOCALITY: *Whitmee s.n.* (BM).

This species is most closely related to *Psychotria insularum*, particularly the narrow-leaved variant (recognized by Rechinger as var. *atroviridescens* and by Christophersen as var. *montanum*) but differs from this in having ovate to elliptic (vs. linear-lanceolate) stipules and longer corollas.

*Reinecke 337*, collected behind Laulii, Upolu, was not located.

20. ***Psychotria insularum*** A. Gray, Proc. Amer. Acad. Arts **4**: 45. 1860; Schumann, Bot. Jahrb. Syst. **25**: 687. 1898; Rech. Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. **85**: 199. 1910; Setchell, Publ. Carnegie Inst. Wash. **341**: 46. 1924; Lloyd & Aitken, Bull. Lloyd Libr. Bot. **33**(4): 105. 1934; Christoph. Bernice P. Bishop Mus. Bull. **154**: 53. 1938; Yunker, Bernice P. Bishop Mus. Bull. **184**: 65. 1945. Var. *typica* Hochr. Candollea **5**: 268. 1934. TYPE: Samoa, without further locality, 1839, *U. S. Expl. Exped. s.n.* (lectotype, here designated, US 67256; isoelectotypes, GH!, K!, US 67257!).

*Psychotria insularum* var. *montanum* Christoph. Bernice P. Bishop Mus. Bull. **154**: 54. 1938. TYPE: Samoa, Savaii, forest above Salailua, 750 m alt., 1931, *Christophersen 2942* (holotype, BISH!; isotype, A!).

*Psychotria insularum* var. *aprica* Rech. Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. **85**: 199. 1910. TYPE: Samoa, Savaii, on lava flow at Safune, 1905, *Rechinger 1043* (holotype, w!).

*Psychotria atroviridescens* Rech. Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. **85**: 198. 1910; Hochr. Candollea **5**: 268. 1934. TYPE: Samoa, Upolu, above Utumapu, 1905, *Rechinger 502* (holotype, w!).

*Psychotria tutuilensis* Christoph. Bernice P. Bishop Mus. Bull. **154**: 59. 1938. TYPE: Samoa, Tutuila, top of Le Pioa, 500 m alt., 1935, *Christophersen 3485* (lectotype, here designated, BISH!).

Shrub or small tree 1–4 m tall. Young stems mostly glabrous, or rarely densely covered with reddish brown hairs; stipules linear-lanceolate with pair of linear lobes 1–2 mm long, connate for most of their length to form sheath, up to 24 mm long. Leaves with petiole 0.5–4 cm long, mostly glabrous; blade lanceolate,



ovate, or elliptic, 6–20 by 2–9 cm, the apex acute to submucronate, the base acute, the surfaces usually glabrous, often drying mottled reddish brown. Inflorescences 1 to 4 (rarely more) loosely branching, terminal or subterminal, several-flowered panicles 1–10 cm long. Flowers with pedicel 1–7 mm long, usually glabrous; calyx campanulate, 1–2 mm long, shallowly divided into 5 acute lobes; corolla tubular, 6–12 mm long, with 5 ovate lobes 2–5 mm long, white, glabrous on outside, densely pilose within; stamens 5, epipetalous in upper throat, included, the anther linear, 0.5–1.5 mm long, the filament ca.  $\frac{1}{2}$  as long as anther; style as long as tube, slightly exserted, stigma lobes 0.5–1 mm long. Fruits ovoid, 6–10 mm long excluding persistent calyx, shiny red at maturity, with 2 or 3 longitudinal ribs on each pyrene face when dry.

**TIPIFICATION.** Christophersen listed two specimens (*Christophersen 3485, 3521*) of his *Psychotria tutuilensis* as types, but this cannot be done. I hereby designate one of these syntypes, *Christophersen 3485* (BISH), as lectotype.

**DISTRIBUTION.** Indigenous to Tonga, Niue, Wallis, Futuna, and all islands of Samoa;<sup>5</sup> in Samoa common understory tree or shrub in coastal to cloud forest; near sea level to 1400 m alt.

**LOCAL NAME AND USE.** *Matalafi*, a well-known name in Samoa. This species is also sometimes called *lau mafatifati* or *fatifati*, meaning “brittle leaf,” but these names also apply to *Geniostoma* spp., which are superficially similar (Whistler, 1984). The leaves are commonly used in Samoan medicines for treating “ghost sickness.”

**ADDITIONAL SPECIMENS EXAMINED.** **Samoa.** SAVAII: Taga, *Bristol 2220* (BISH, GH, K); above Matavanu, *Christophersen 836* (BISH, W), *2015* (A, BISH, US, W), *2047* (BISH), *2171* (BISH), *2197* (A, BISH, M, US); near Vaipouli, *Christophersen 1849* (A, BISH); behind Safune, *Christophersen 2433* (BISH); near Saleaula, *Christophersen 2464* (BISH); Safune-Aopo, *Christophersen 2493* (BISH); near Salailua, *Christophersen 2587* (BISH), *2590* (A, BISH, M, US), *2591* (BISH), *2592* (A, BISH, W), *3119* (BISH); near Taga, *Christophersen 2834* (A, BISH, K, US); Faala, *Cox 91* (GH); Faala-Tafuatai, *Cox 161* (BISH, GH, K); near Malo, *Rechinger 1109* (W), *1178* (W); Aopo-Asau, *Rechinger 1945* (W); Matautu, *Vaupel 66* (B, BISH, K, M, US, W, WRSL); Aopo, *Vaupel 175* (B, M); S of Maugaloa, *Vaupel 637* (B); above Ologogo, *Whistler 513* (BISH, BM, PTBG); above Asau, *Whistler 1746* (PTBG, US); Puapua-Saumalaeulu, *Whistler 2193* (PTBG). APOLIMA: *sine loco*, *Rechinger 268* (BM, W). MANONO: *sine loco*, *Rechinger 558* (W); behind Faleu, *Whistler 4509* (K, PTBG, US). UPOLU: Lefaga, *Bristol 1960* (BISH, GH), *1977* (BISH, GH), *2046* (BISH), *2485* (BISH, GH, K); “open forest on foothills,” *Bryan 97* (BISH, K, M); above Malololelei, *Christophersen 2* (BISH), *195* (A, BISH), *237* (BISH, US); near Apia, *Eames 12* (BISH, US); near Vailima, *Eames 77* (BISH); Moamoa, *Eames 207* (BISH, GH); *sine loco*, *Funk 72* (BM); *sine loco*, *Graeffe 12* (BM), *31a* (HBG), *31b* (HBG), *47a* (HBG), *206, pro parte* (HBG), *212, pro parte* (HBG), *218* (HBG); Lanotoo, *Hochreutiner 3277* (G, GH (fragment)); Falefa, *Hochreutiner 3452* (G, GH (fragment)); Mt. Vaea, *MacDaniels 1117* (BISH); Toamua, *McKee 2906* (BISH); S coast at Aufaga, *McKee 2925* (BISH, E, K); Afiamalu, *McKee 2973* (BISH, E); above Vailele, *McKee 3004* (BISH); Mt. Vaea, *Rechinger 330* (W); near Safata, *Rechinger 555* (W); near Motootua, *Rechinger 569* (W); near Malifa, *Rechinger 572* (W); Lanotoo, *Rechinger 620* (W), *717* (W), *763* (BM, K, US, W); near Laulii, *Rechinger 1258* (W); above Vaisigano, *Rechinger*

<sup>5</sup>It is also reported from Hawaii on the basis of a Mann and Brigham specimen collected over 150 years ago (Sohmer, 1977), but the specimen is lost and the record doubtful.



1456 (w); near Samea, *Reinecke* 85 (E, G); Tofua, *Reinecke* 92 (G); Mt. Sigaele, *Reinecke* 335 (G); *sine loco*, *Walter* 2 (BISH); near Laulii, *Whistler* 379 (B, BISH, PTBG, US); near Lanotoo, *Whistler* 422 (PTBG, US), 423 (PTBG), 2176 (PTBG); Nuutele Is., *Whistler* 467 (B, BISH, PTBG, US), 595 (BISH, PTBG, US), 3520 (PTBG); near Saaga, *Whistler* 1110 (B, BISH, PTBG, US); Mt. Fiamoe, *Whistler* 1165 (K, PTBG, US); Afulilo, *Whistler* 1579 (PTBG); near Amaile, *Whistler* 1835 (BISH, PTBG, US); Nuulua Is., *Whistler* 1944 (BISH, K, PTBG), 4235 (BISH, PTBG), 4426 (K, PTBG, US); Fanuatapu Is., *Whistler* 4411 (PTBG, US). TUTUILA: "forest on ridges," *Bryan* 85 (BISH); Papatele ridge, *Christophersen* 1009 (BISH); Matafao ridge, *Christophersen* 1043 (BISH); Alava ridge, *Christophersen* 1820 (A, BISH, US), 1826 (BISH); Le Pioa, *Christophersen* 3521 (A, BISH), 3550 (BISH), 3557 (BISH), 3558 (BISH); Pago Pago, *Diefenderfer* 11 (BISH); Goat Is., *Garber* 792 (A, BISH); behind Pago Pago, *Garber* 932 (BISH, US); Vatia trail, *Lamoureux* 3007 (PTBG), 3012 (PTBG); *sine loco*, *Long* 1983 (PTBG), 1990 (PTBG), 1994 (PTBG); Fagasa-Matafao, *Long* 3065a (BISH); Pago Pago reservoir trail, *Long* 3086 (PTBG), 3102 (BISH, PTBG); behind Fagatogo, *Mitchell* 506 (BISH); *sine loco*, *Mitchell* 517 (BISH); Fagasa trail, *Setchell* 82 (UC, US); behind Pago Pago, *Setchell* 256 (GH, UC), 526 (UC), 572 (UC); Alava ridge, *Spense* 484 (BISH); near Tafuna, *Whistler* 1437 (BISH, G, PTBG, US); Aoloaufou, *Whistler* 2737 (B, BISH, G, K, PTBG); Alava ridge, *Whistler* 2767 (B, BISH, PTBG), 3638 (PTBG); near Matafao, *Whistler* 3542 (PTBG); Le Pioa, *Whistler* 3666 (PTBG), 3667 (PTBG); Pago Pago, *Wilder* 17 (BISH), 78 (BISH); near Aua, *Wilder* 47 (BISH); Tafuna, *Wisner* 61 (BISH), 67 (BISH); Breakers Point, *Wisner* 130 (BISH); above Pago Pago, *Yuncker* 9350 (BISH). OFU: behind Ofu Village, *Yuncker* 9444 (BISH), 9476 (BISH). TAU: Mt. Tau, *Cox* 310 (BISH, GH, K); Fitiuta trail, *Garber* 555 (A, BISH); behind Faleasao, *Garber* 573 (BISH); near Laufuti, *Garber* 768 (BISH, K); above Luma, *Whistler* 1398 (G, PTBG); near Siufaga, *Yuncker* 9008 (BISH); Fitiuta trail, *Yuncker* 9060 (BISH). WITHOUT FURTHER LOCALITY: *Graeffe* 85 (BM), 86 (BM), 97 (BM), s.n. (BM); *Whitmee* 59 (MEL), 81, *pro parte* (MEL), 122 (MEL), 126 (K).

This species is quite variable—enough so that Rechinger and Christophersen both described one other species and variety within the complex. The width of the broadest leaves of specimens collected from sea level to 300 m ranges from 5 to 9 cm, while that of the specimens from over 500 m is 2–3 cm. Based solely upon this difference, Christophersen described var. *montanum* comprising his specimens from the higher elevations. This appears to be the same as Rechinger's *Psychotria atroviridescens*, which would then be a synonym of var. *montanum*. Rechinger also named var. *aprica* from the lava flows of Savaii, but the differences noted are vegetative and minor and may be more a result of the lava substrate than of genetic differences. Christophersen recognized the individuals collected from the trachyte plugs of Tutuila (Le Pioa and Matafao) as constituting a distinct species, *P. tutuilensis*, but again, this taxon does not seem very distinct, at least at the species level, and may merely be an ecotype adapted to the impoverished soil on these two peaks.

There may, however, be one distinct variety: *Whistler* 1835, *Christophersen* 2587, *Christophersen* 836, and *Vaupel* 175 have inflorescences densely covered with erect, reddish brown hairs. This does not seem to be merely a geographic or edaphic variation because the specimens were collected on different islands (three on Savaii, one on Upolu), in different habitats, and from ca. 200 to 1000 m elevation. This character also appears on *Mackee* 19909 (BISH), the single specimen of *Psychotria insularum* seen from Uvea (Wallis). Until I see more specimens from Uvea, I hesitate to recognize a variety formally.

Three specimens listed by Reinecke were not located and are probably lost.



These are *Graeffe 1608*, without further locality; *Reinecke 195*, collected at Mulifanua, Upolu; and *Reinecke 341*, from Lanoanea, Upolu.

#### UNDETERMINED SPECIES

Two of the specimens I saw could not be identified. *Graeffe 206*, *pro parte* (HBG), from Upolu, without further locality, and *Rechinger 147* (w), collected above Motootua, Upolu, but listed by Rechinger as *Randia* sp., appear to be identical, but both lack flowers. They probably belong to *Psychotria*—possibly to a new species—but are inadequate for description.

#### ACKNOWLEDGMENTS

I am greatly indebted to the faculty and staff of the herbaria that I visited and from which I borrowed specimens during the course of my work. I also wish to thank Dr. William Theobald, of the Pacific Tropical Botanical Garden, for his sponsorship of much of the research; Dr. A. C. Smith, of the same institution, for his helpful comments on some of the species; Dr. Harold St. John, of the Bishop Museum, for his help with the Latin descriptions; Dr. Gerald Carr, of the University of Hawaii Botany Department, for his assistance with the chromosome counts; and Dr. Cliff Smith, of the same department, for his help with the word processor used.

#### LITERATURE CITED

- CHRISTOPHERSEN, E. 1938. Flowering plants of Samoa—II. Bernice P. Bishop Mus. Bull. **154**: 1–77.
- DARWIN, S. P. 1979. A synopsis of the indigenous genera of Pacific Rubiaceae. *Allertonia* **2**: 1–44.
- FOSBERG, F. R. 1937. Some Rubiaceae of southeastern Polynesia. Occas. Pap. Bernice Pauahi Bishop Mus. **13**: 245–293.
- . 1939. *Psychotria* (Rubiaceae) in the Marquesas Islands. Herb. Mus. Paris Not. Syst. **8**: 161–173.
- . 1941. Rubiaceae. In: A. C. SMITH AND COLLABORATORS, Fijian plant studies, II. *Sargentia* **1**: 118–140.
- GRAY, A. 1860. Notes upon some Rubiaceae, collected in the United States South-Sea Exploring Expedition under Captain Wilkes, with characters of new species, &c. Proc. Amer. Acad. Arts **4**: 33–50.
- HOCHREUTINER, B. P. G. 1934. Plantae Hochreutineranae, III. *Candollea* **5**: 175–341.
- LAUTERBACH, K. 1908. Beitrage zur Flora der Samoa-Inseln. Bot. Jahrb. Syst. **41**: 215–238.
- RECHINGER, K. 1908. Plantae novae Pacificae. IV. Feddes Repert. Spec. Nov. Regni Veg. **6**: 325–328.
- . 1909. Plantae novae Pacificae. VI. *Ibid.* **7**: 168.
- . 1910. Botanische und zoologische Ergebnisse einer wissenschaftlichen Forschungsreise nach den Samoa-Inseln dem Neuguinea Archipel, und den Salomoninseln von Marz bis Dezember 1905. Denkschr. Kaiserl. Akad. Wiss., Math.-Naturwiss. Kl. **85**: 139–213.
- REINECKE, F. 1898. Die Flora der Samoa-Inseln. Bot. Jahrb. Syst. **25**: 578–708.
- SMITH, A. C. 1936. Fijian plant studies. Bernice P. Bishop Mus. Bull. **141**: 1–166.



- SOHMER, S. H. 1977. *Psychotria* L. (Rubiaceae) in the Hawaiian Islands. *Lyonia* **1**: 103–186.
- WHISTLER, W. A. 1984. Annotated list of Samoan plant names. *Econ. Bot.* **38**: 464–489.